RICE UNIVERSITY

P.L.A.T.F.O.R.M
The Public of Lagos Agency of Trash Formation, Organization, Remediation, and Management

by

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A THESIS SUBMITTED
IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE

Masters of Architecture

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HOUSTON, TEXAS
MAY 2012

ABSTRACT

P.L.A.T.F.O.R.M

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Lagos, Nigeria is a city of rapidly shifting conditions and perpetual crises with issues of over population, pollution, limited circulation, waste management, density, poverty, and social disparity. These conditions have resulted in the proliferation of slum settlements along the coastal edges of the megacity.

However, the radical conditions of Lagos promote new solutions for the city. Waste provides the mass for coastal expansion, and defense from sea-rise. Expansion of the coastline provides new territories for the growth of slums. Geometry can maximize efficiency and minimize contamination.

P.L.A.T.F.O.R.M., makes use of the processes associated with Lagos waste management and the expansion of the slums, while mitigating the harmful effects of contamination and providing a defensive barrier against sea-level rise.

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ACKNOWLEDGEMENTS

I would like to first thank my beautiful wife, Mary-Jane. Without her constant support and confidence, I would not have completed this project.

I would also like to thank Neeraj Bhatia for his continued sound advice.

I would also like to thank in no particular order, Konrad and Diane Lee, Ann and Ryan Odom, Elena English, Scott Colman, Tucker Douglas, Quinn Lammie, Chris Duffel, Doug and Katheryn Castleton, Clayton Fry, Edgar Cervantes, Will Clifton, and Kent Fitzsimmons.

I'd also like thank the Faculty of Rice School of Architecture and those whose comments helped form my thesis project throughout the semester.

P.L.A.T.F.O.R.M.

The Public of Lagos Agency of Trash Formation, Organization, Remediation and Management

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I. Lagos, Nigeria

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1. Density
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I. Lagos, Nigeria

I.A. Portrait of a Megacity

Lagos has become a destination for rural populations seeking better living conditions and wages.[1] The city is the commercial center of the country and arguably all of West Africa. Nigeria's wealth, due largely to its abundant resources of oil in the Niger Delta, also dramatically exceeds that of its neighbors. The country's population dwarfs that of the surrounding countries due to the immigration of these workers.[2] However, this comparatively extreme wealth does not filter down to the majority of the country's inhabitants.

Most of the immigrants from the rural countryside or from neighboring countries gather near their places of work and have very little money. This immobile populous, stationed near the city center, has caused an enormous growth of makeshift slums settlements. The slums of Lagos, some of the largest in the world, house the majority of these poor migrant workers, and rely on a weak improvised infrastructure with little or no services.[3]

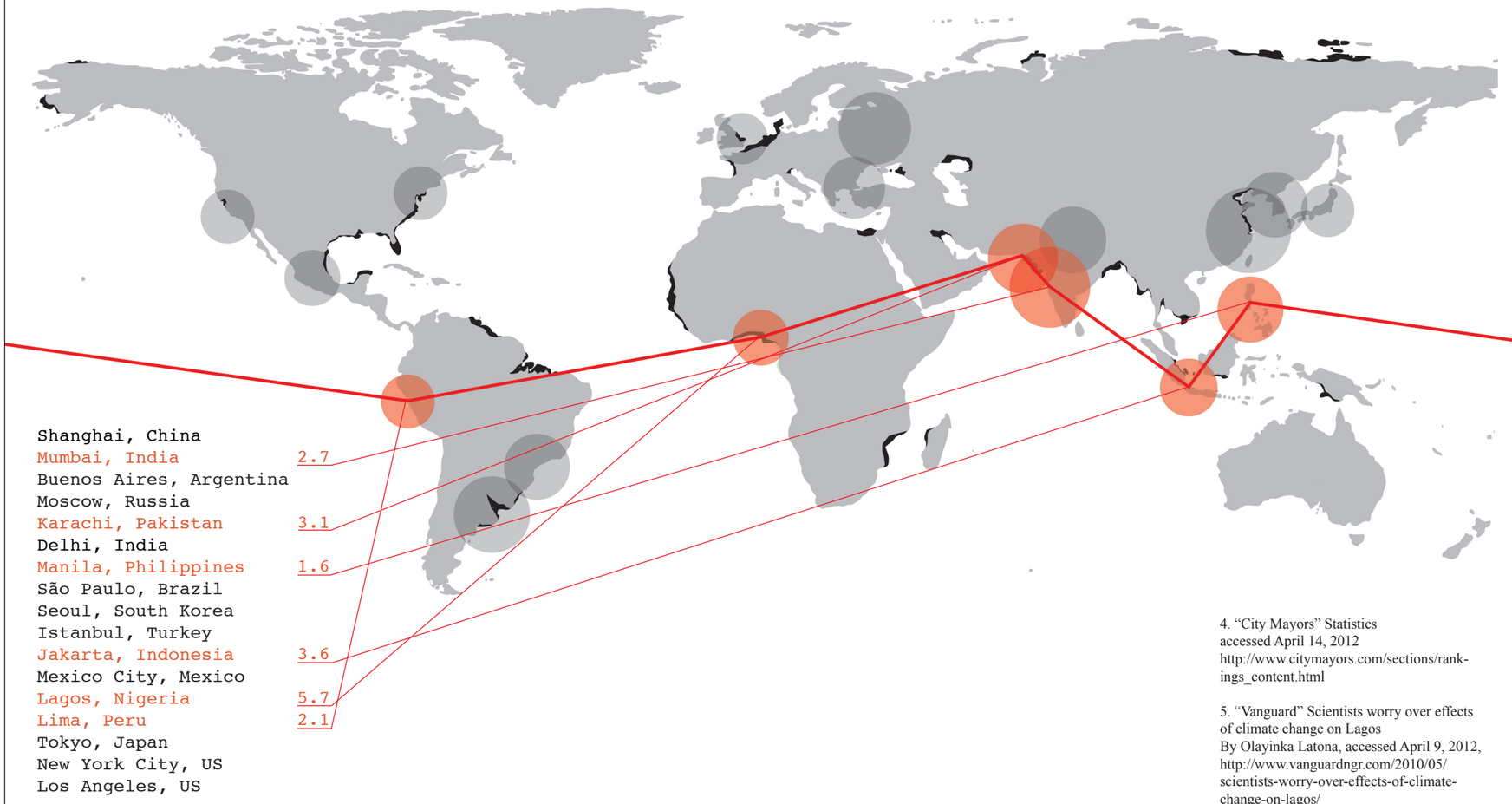
Although Nigeria and the country's major center, Lagos, enjoys a degree of productivity and wealth, little effort has gone into the expansion and development of the existing infrastructures. The current urban and social difficulties in Lagos present a worthy forum for an investigation into the potentials of architecture as an organizing agent within a network of complex systems.

1. "Rising Sea Levels", 2015 | Rising Seal Levels, accessed April 9, 2012 http://www.global-warming-forecasts.com/sea-levels-rising.php

2."CIA: The World Factbook" Africa: Nigeria, accessed April 14, 2012 https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html

3.IRIN: humanitarian news and analysis; a service of the UN Office for the Coordination of Humanitarian Affairs, Nigeria: Lagos, the Megacity of Slums http://www.irinnews.org/Report/60811/NIGERIA-Lagos-the-mega-city-of-slums

Fig.1 The Urban Coast



I.A.1. Sea-Rise

Around the world, over 600 million people live in coastal areas within 30 miles of sea level.[4] Sea level rise threatens to encroach many of these urban centers, damaging property and displacing populations. Coastal areas house the world's ports as well, connecting global economies and providing necessary goods and resources. A significant rise in sea level represents a debilitating blow to the world's population and economy.

Predictions of sea level rise place many of the coastal slums in Lagos underwater with the next one hundred years.[5] The absence of an infrastructural and developmental plan for these dangers poses a major threat to the slums.

4. "City Mayors" Statistics
accessed April 14, 2012
http://www.citymayors.com/sections/rankings_content.html

5. "Vanguard" Scientists worry over effects of climate change on Lagos
By Olayinka Latona, accessed April 9, 2012,
http://www.vanguardngr.com/2010/05/scientists-worry-over-effects-of-climate-change-on-lagos/

Lima, Peru

Population:
8.3 million

Growth Rate:
2.1%

New Citizens/Year:
174300

Lagos, Nigeria

Population:
8.6 million

Growth Rate:
5.7%

New Citizens/
Year:
490200

Karachi, Pakistan

Population:
10 million

Growth Rate:
3.1%

New Citizens/Year:
310000

Mumbai, India

Population:
12.6 million

Growth Rate:
2.7%

New Citizens/Year:
340200

Jakarta, Indonesia

Population:
9 million

Growth Rate:
3.6%

New Citizens/Year:
324000

Manila, Philippines

Population:
10.3 million

Growth Rate:
1.6%

New Citizens/Year:
256000

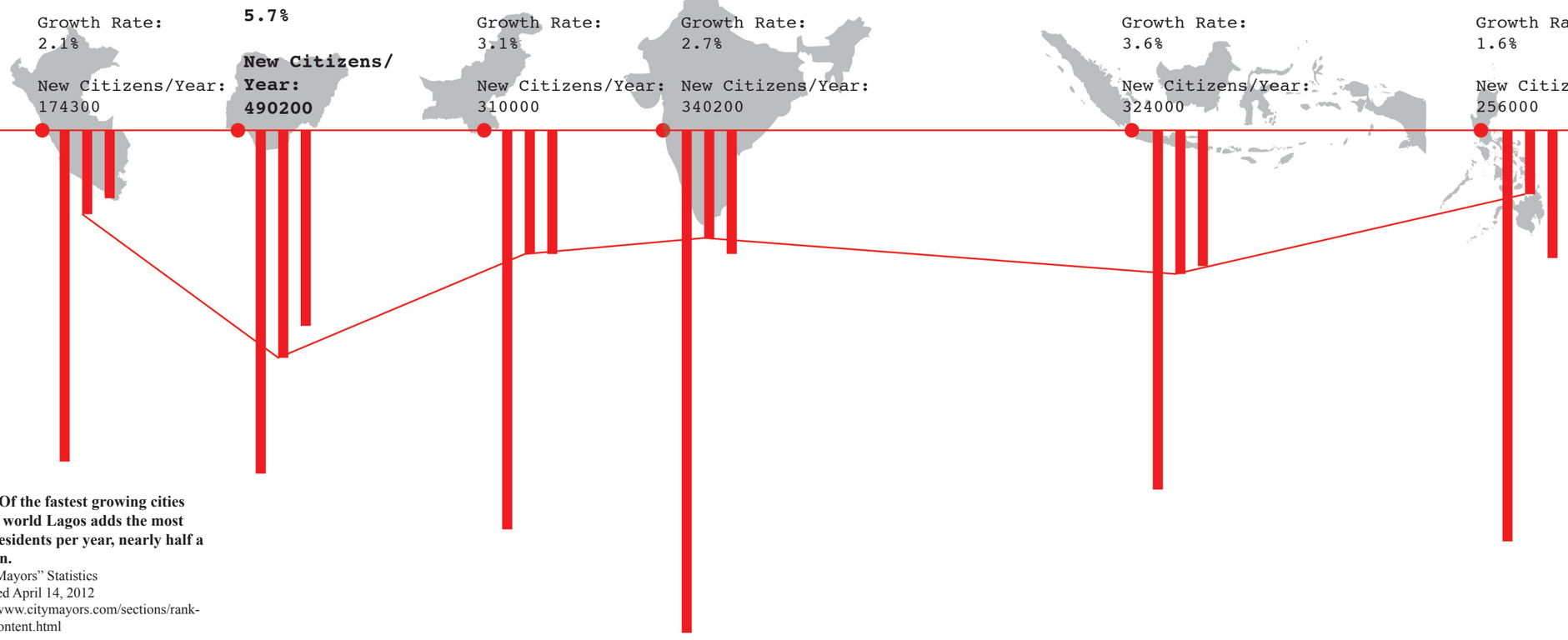


Fig.2 Of the fastest growing cities in the world Lagos adds the most new residents per year, nearly half a million.
"City Mayors" Statistics
accessed April 14, 2012
http://www.citymayors.com/sections/rankings_content.html

Brian Lee 2012

I.A.2. Density

Lagos faces a continued influx of rural workers seeking a better life in the city. Lagos has a population density of 7,941/km² (20,170/sq mi), a number increasing with continued growth.[6] The lack of planning and an out-paced urban development model has lead to an extremely dense urban condition slowing transportation, impeding the delivery of services, and providing little space for expansion. Many of the housing units are built independently of the existing growth infrastructure, as temporary or improvised living quarters. The settlements have no power and the local waterways act as the only outlet for sewage and waste.[7] With continued growth and density of the city these problems only intensify.

I.A.3. Waste

The density within the city and the absence of an infrastructure to facilitate traditional methods of habitation, power delivery, and public works, exaggerate the additional problem of waste management. Lagos creates enormous amounts of waste in addition to the garbage that is shipped into the city from other nations because of the low costs of disposal.[8] The quantity of garbage has caused the creation of expansive trash dumpsites.

6."2006 Population Census" National Bureau of Statistics of Nigeria. May 2007. accessed April14, 2012.

7. The New York Times
By Roger Cohen Published: July 20, 1998
Nigerian Slum's Filth Is a World Away From Capital's Glitter
http://www.nytimes.com/1998/07/20/world/nigerian-slum-s-filth-is-a-world-away-from-capital-s-glitter.html

8. "Intergovernmantal Panel on Climate Change", Climate Change 2007: Working Group II: Impacts, Adaptation and Vulnerability, 9.4.6 Coastal zones, accessed April 7, 2012, http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch9s9-4-6.html

II. Issues and Potentials

II.A. Sea-Rise

II.A.1. Issues

Because the growth of the cities outpaces the developmental plans, temporary slum settlements have emerged to cope with expanding low-income populations. Not only do these slum areas face extreme challenges of poverty, density and sanitation, but predicted levels of sea rise over the next one hundred years indicates that much of the territory of the coastal slums will be over taken by water. With a predicted two meter rise over the next one hundred years the coastal slums of Makoko would be completely overtaken by water displacing the estimated 100,000 residents.[9]

Lagos stands to suffer greatly from the predicted natural calamity of sea-rise. As migration to the West African center continues, coastal region population continues to grow, particularly within the informal slum settlements. Their location along coastal edges and their extreme density leave these areas vulnerable to rising water.

The Intergovernmental Panel on Climate Change identifies Lagos at risk from sea-level rise by as soon as 2015.[10] With a high population growth rate and increasing density this will force significant

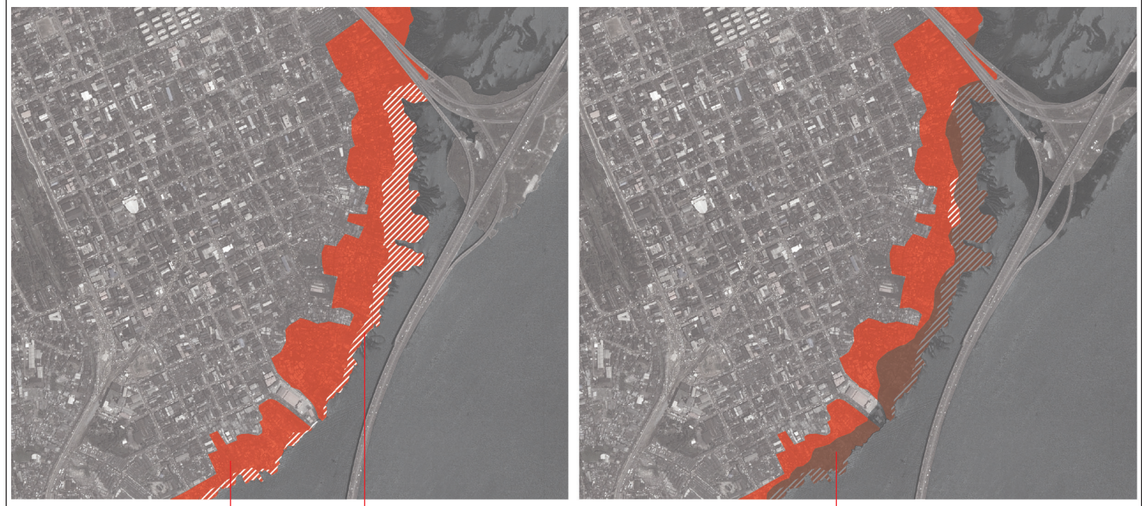
9. Fodor.com,
Makoko, Lagos - reportage
http://www.fodors.com/community/africa-the-middle-east/makoko-lagos-reportage.cfm

10. "Intergovernmantal Panel on Climate Change", Climate Change 2007: Working Group II: Impacts, Adaptation and Vulnerability, 9.4.6 Coastal zones, accessed April 7, 2012
http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch9s9-4-6.html

migration in and around the city in addition to social and economic hardship. With an already antiquated model of transportation infrastructure and organization, Lagos faces enormous obstacles in regards to potential sea rise.

II.A.2. Potentials

The temporal nature of the settlements and their vulnerability to the forces of sea-rise highlights the importance of developing a solution. Sea level rise places the issues of the coastal slums at the forefront of urban challenges facing Lagos.
Given a framework, the informal housing of the slums can adapt over time. This resilience repositions the designer as an organizer of that framework and the complex systems characteristic of the site.



Coastal slums.

Expanded slums due to on water construction and sand and garbage dumping.

Predicted levels of sea rise.

Fig.3 Coastal Slums and Sea Rise

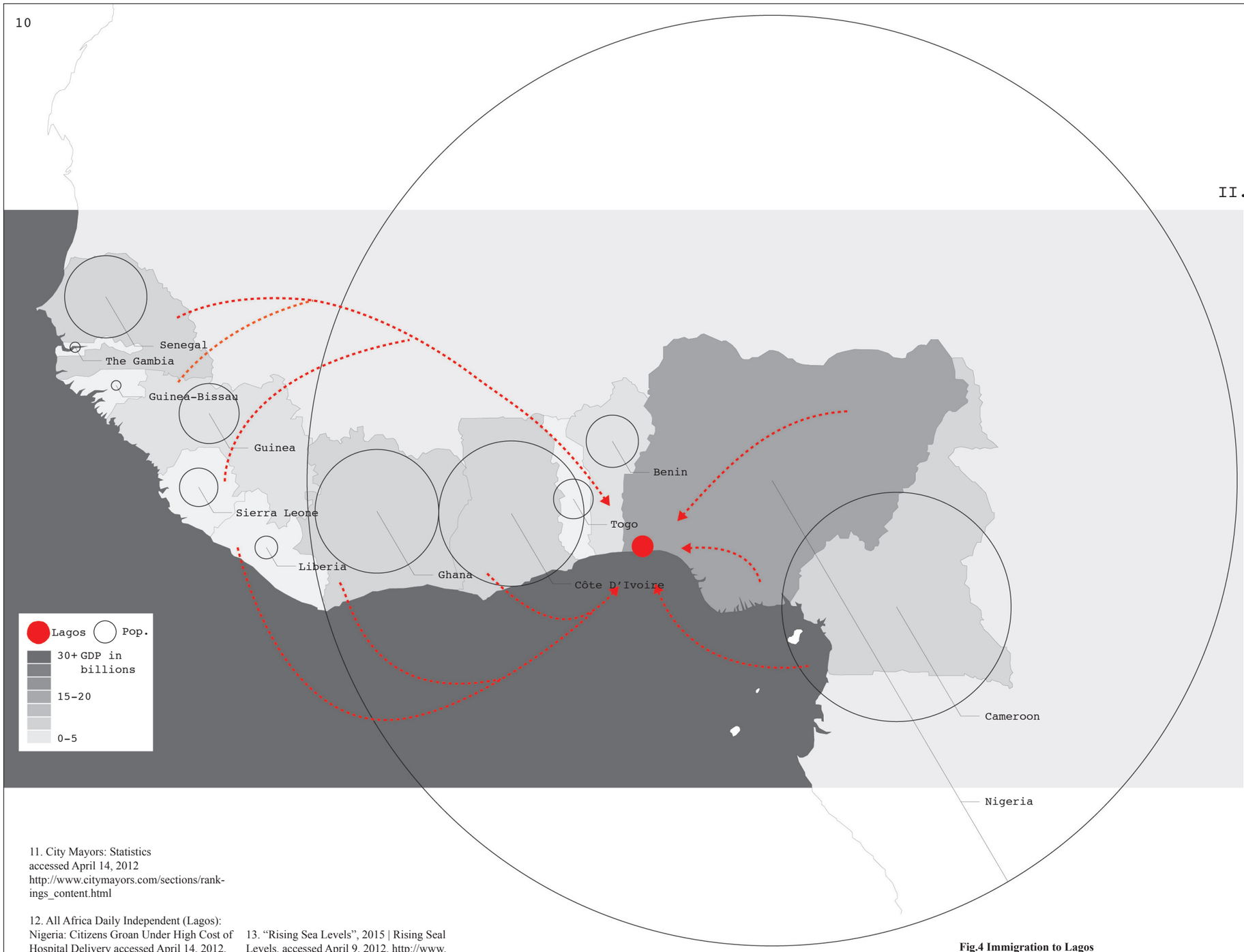


Fig.4 Immigration to Lagos

II.B. Growth and Density

II.B.1. Issues

For Lagos, an estimated population growth of nearly six percent equates to about a half a million new residents per year.[11] The largest and fastest growing city in Sub-Saharan Africa, Lagos barely manages to support the influx of migrants and rural transplants seeking work in the region's financial and commercial center, let alone the extreme internal fertility rate of its own people (The rate in Lagos is 4.0, which means the average woman in Lagos will have four children in her lifetime).[12] Factors pushing migration to Lagos include deforestation, soil erosion, flooding, decrease of arable land, water shortages, and other problems related to natural resources throughout Nigeria and West Africa. The megacity as a commercial center attracts rural populations in the search of better life, better services, and health care.[13]

The growth of Lagos has led to a conflict between two types of development; a formal public development plan involving a bureaucratic a top down model, and a bottom up improvisation of slum dwelling.

Nigeria's wealth from oil reserves and banking provided funds for the city's growth, however, these models did not

11. City Mayors: Statistics accessed April 14, 2012 http://www.citymayors.com/sections/rankings_content.html

12. All Africa Daily Independent (Lagos): Nigeria: Citizens Groan Under High Cost of Hospital Delivery accessed April 14, 2012, http://allafrica.com/stories/201105190546.html

13. "Rising Sea Levels", 2015 | Rising Seal Levels, accessed April 9, 2012, http://www.global-warming-forecasts.com/sea-levels-rising.php

Fig.5 The Makoko Slums built over water.
Stephen Mudiari
http://www.flickr.com/photos/38571830@N04/4565749412/

Fig.6 Waste dumped below slum settlements.
Spiegel Online
http://www.spiegel.de/fotostrecke/fotostrecke-16370.html

Fig.7 Slums and the water's edge.
John Vidal
http://www.guardian.co.uk/pictures/image/0,8543,-10105140983,00.html

account for the continued extremity of that growth or immigrant influx. As the formal publicly planned urbanization strategies have failed to keep pace with current growth rates, new inhabitants in large part advance the expansion of the city's borders through the construction of the informal slums.

The lack of housing facilities extends across most of the demographic strata in Lagos, with middle and low-income populations living in very crowded accommodations. Shared housing is ubiquitous within the slums where many small residences house two to three large families.[14] These residences lack basic services of sewage and electricity.

Many of the slums rely on access from the surrounding waterways, bypassing existing modes of urban circulation and development. Large, dense communities have arisen along coastal regions, some settlements actually built on the water. The Makoko and Badia slum communities nearest to the city center are settlements built on the marshes around the Third Mainland Bridge, a major piece of transportation infrastructure. These slums, partially floating and half submerged by highway interchanges, act as infill to the cities minimal vacant space and ignore the geographic boundaries of the city by expanding into the coastal waters of Lagos Lagoon.[15]

14. "CSI Environment and development in coastal regions and in small islands" Clean up Nigerian boss speaks on waste management crisis in Lagos, accessed April 9,2012, http://www.unesco.org/csi/act/lagos/lagnews-now.htm

15. BBC Welcome to Lagos Film Documentary Series
http://www.bbc.co.uk/programmes/b00s3vdm

Fig.8 Walkways over water.
Gregor.us
It's A Planet Of Slums
http://gregor.us/coal/its-a-planet-of-slums/

Fig.9 The Makoko Slums built over water.
Stephen Mudiari
http://www.flickr.com/photos/38571830@
N04/4565749412/

Fig.10 The slums and Third Mainland Bridge.
Yann Arthus-Bertrand
http://www.yannarthusbertrand.org/

2. Potentials

Despite the grim living conditions of the slums along the water's edge, there is a sense of resolve and entrepreneurship with in the slum settlements. The coastal slum of Makoko has become and unofficial port for the exchange of goods and services. Residents have established themselves as business owners in the trade of myriad occupations from barbershops to sand harvesting for the expansion of the coastline. The density of the settlements generates the need for commerce, and the improvisation of the residents provides the services and in turn their livelihood.

II.C. Waste Management

1. Issues

Waste management has become a huge difficulty for the city. Like many infrastructural inefficiencies in Lagos responsibility for garbage organization and disposal has moved to a local scale. Waste is either disposed through private groups or community efforts. Disposal commonly occurs illegally with garbage being dumped in valleys, swamps, public drains, or open water. Estimated amounts of solid waste generated approach almost one million tons per year.[16] Government provided communal waste containers exist in certain areas of the city, however, often waste from communal containers is not collected and refuse must be transported to dumping sites by individuals or privately hired trash collectors.[17]

Many of the problems surrounding waste management are connected to issues of growth and density within the city. For collection trucks to transport waste in Lagos from a collection point to a dumpsite is extremely difficult as a result of heavy traffic jams that plague the city. Furthermore strikes paralyze entire neighborhoods where trash fills the streets and recovery takes weeks.[18]

16. “CSI Environment and development in coastal regions and in small islands” Clean up Nigerian boss speaks on waste management crisis in Lagos, accessed April 9,2012, http://www.unesco.org/csi/act/lagos/lag-news-now.htm

17. IRIN: humanitarian news and analysis a service of the UN Office for the Coordination of Humanitarian Affairs NIGERIA: Lagos pays the price of population surge http://www.irinnews.org/Report/65820/NIGERIA-Lagos-pays-the-price-of-population-surge

18. “CSI Environment and development in coastal regions and in small islands” Clean up Nigerian boss speaks on waste management crisis in Lagos, accessed April 9,2012, http://www.unesco.org/csi/act/lagos/lag-news-now.htm

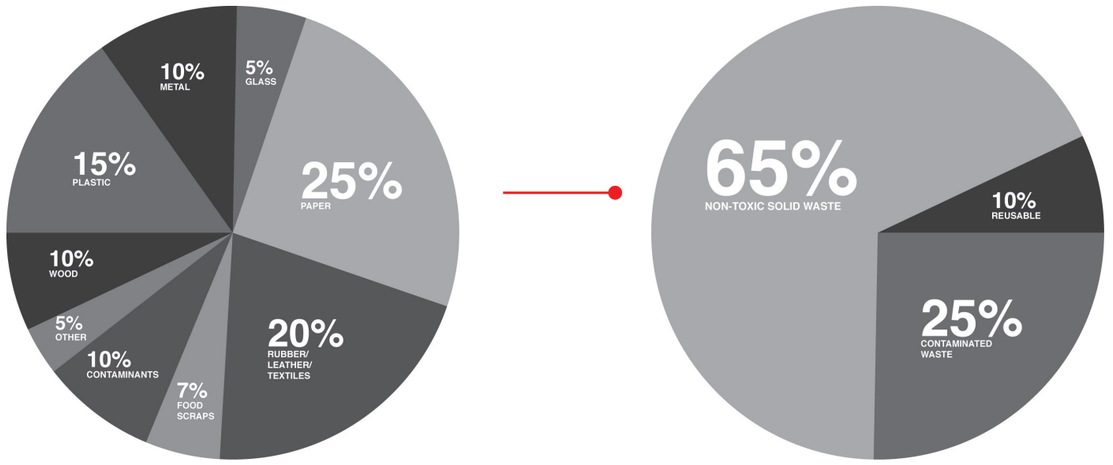


Fig.11 Garbage Composition
Environmental Protection Agency
http://www.epa.gov/osw/wycd/catbook/what.htm

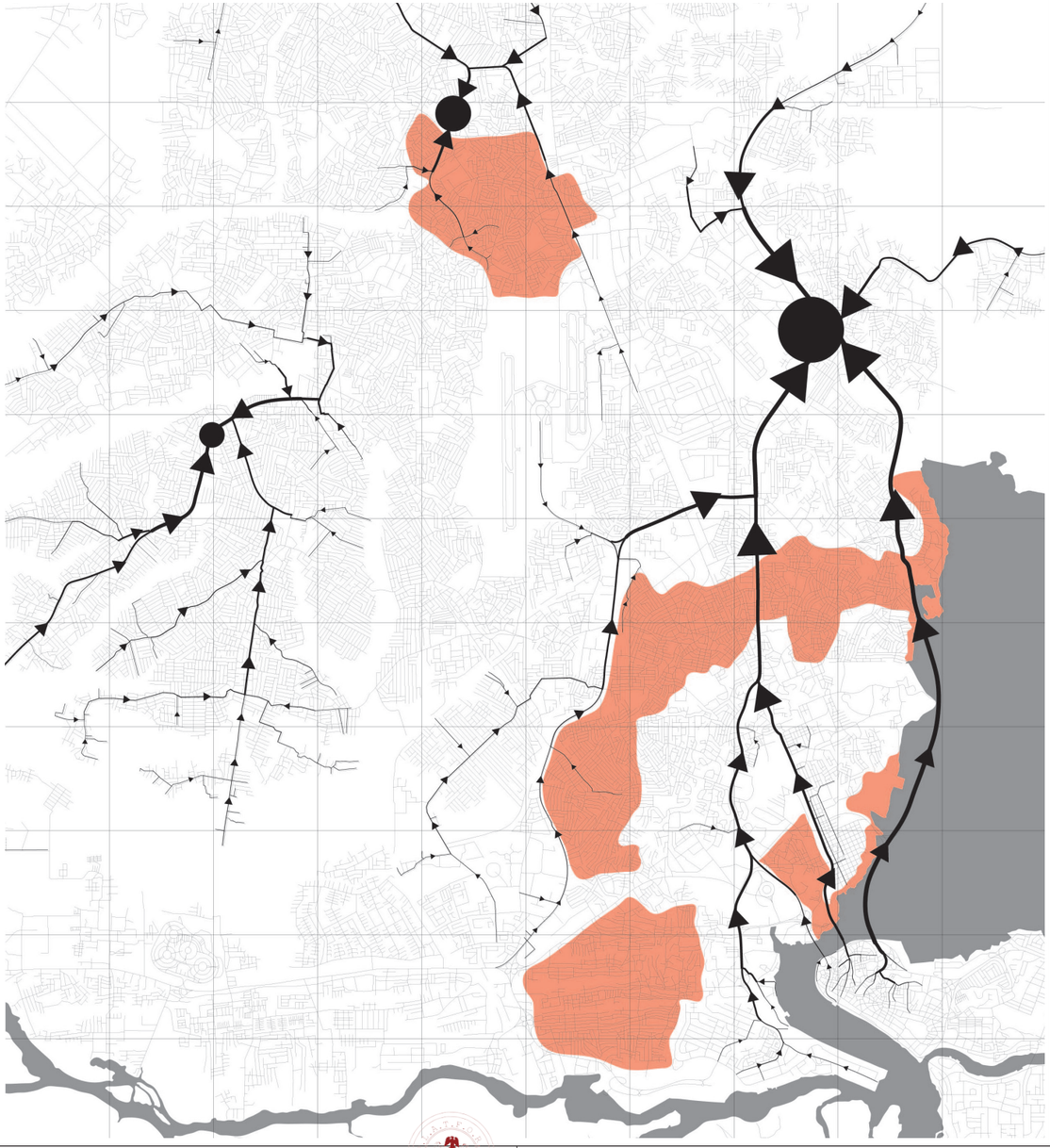


Fig.12 The formalized trashed routes and dumping sites in Lagos are concentrated in the north.
Dumpsite are limited the distances trucks have to travel to dump and the size of allocated dumping areas.
Lagos Waste Management Authority
http://www.lawma.gov.ng/

II.C.2. Potentials

The crises of waste management has become an opportunity and given rise to innovation within Lagos. Because the responsibility of garbage disposal has fallen to the private sector, commercial activities have emerged based on the resale of recyclable materials. Entire communities have developed around the disposal and organization of trash. Armies of sorters wait alongside dump trucks searching for valuable materials that can be sold and reused. Garbage has also become valuable in ventures of land formation. Along the coastal edges garbage is used as fill creating new coastal edges. The trash is dumped into the water, covered in sawdust and sand and slums settlements are built on top of the newly acquired land.

As a result of the dumping process, much of the water surrounding the slums has become contaminated. This water is crucial to the survival of the slum populations serving both as a water source and transportation network. However, there is currently little effort made at containing or reducing the contamination of these waters.

Dumpsite
Dumping Routes
Slums

III. P.L.A.T.F.O.R.M.

III.A. Intent

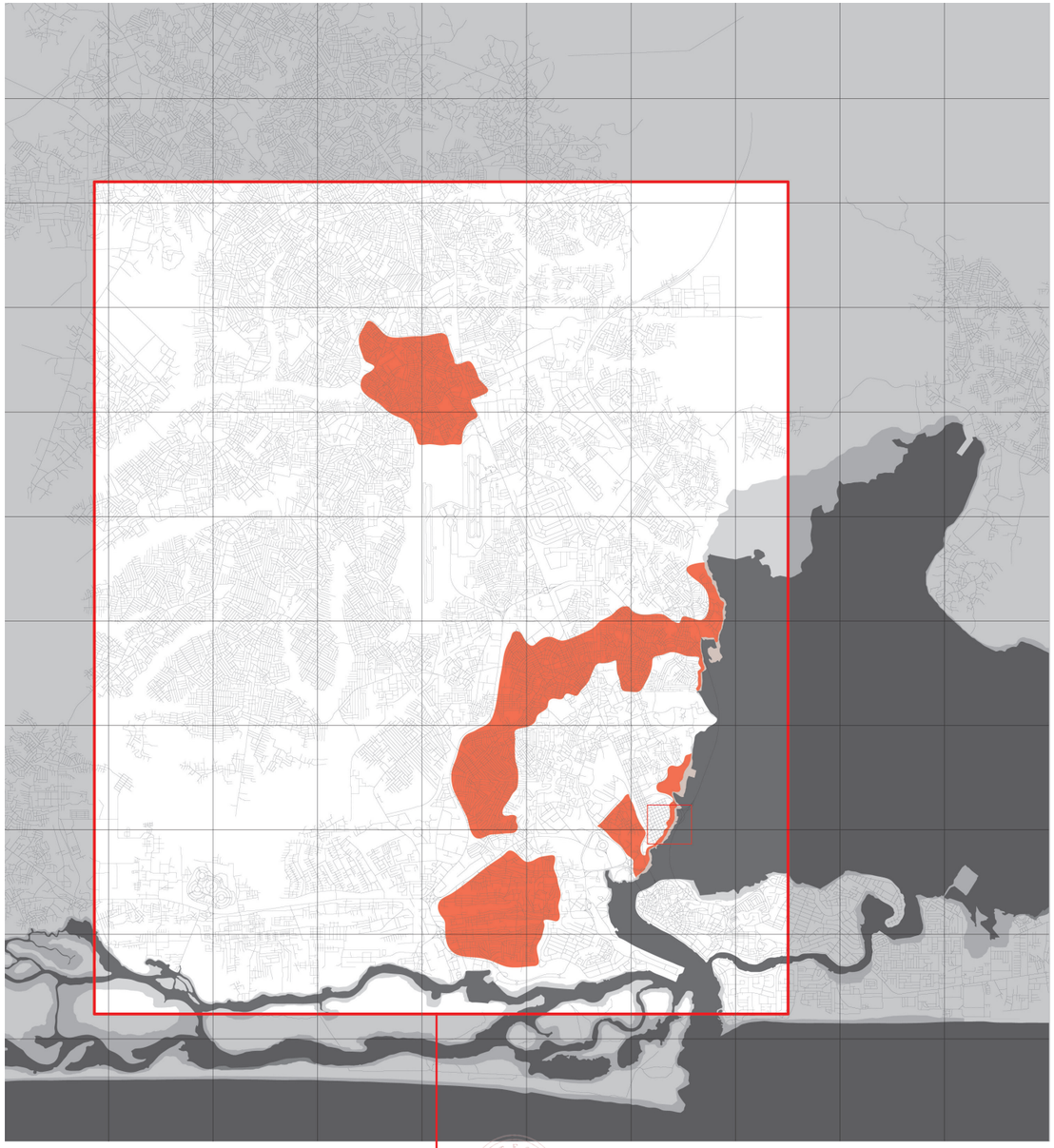
III.A.1. Brief

The social and ecological extremes of the West-African center have not thrown the city into an imbalance or disorder that the traditional model of urban planning would have predicted. These problems have been managed by an unconsciously collective effort from the citizenry. They are seen as opportunities for their inherent processes; a way to survive for the individual. Speaking of Lagos, Koolhaas remarked, “[the] shortcomings have generated ingenious, critical alternative systems, which demand a redefinition of ideas such as carrying capacity, stability, and even order”.[19] This condition of adaptability and resourcefulness presents an interesting environment for an intervention that can better exploit innate aspects of the existing systems.

The radical conditions of Lagos promote new solutions for the city. Within each of these problems reside inherent processes and qualities that can be interdependently linked. Garbage provides the mass for coastal expansion, and defense from sea-rise. Expansion of the coastline provides new territories for the growth of slums. Geometry can maximize efficiency and minimize contamination.

19. Rem Koolhaas Mutations, Project On The City: Lagos p. 652

P.L.A.T.F.O.R.M., seeks to make use of the processes associated with Lagos waste management and the expansion of the slums, while mitigating the harmful effects of contamination and providing a defensive barrier against sea-level rise.



III.A.2 Site

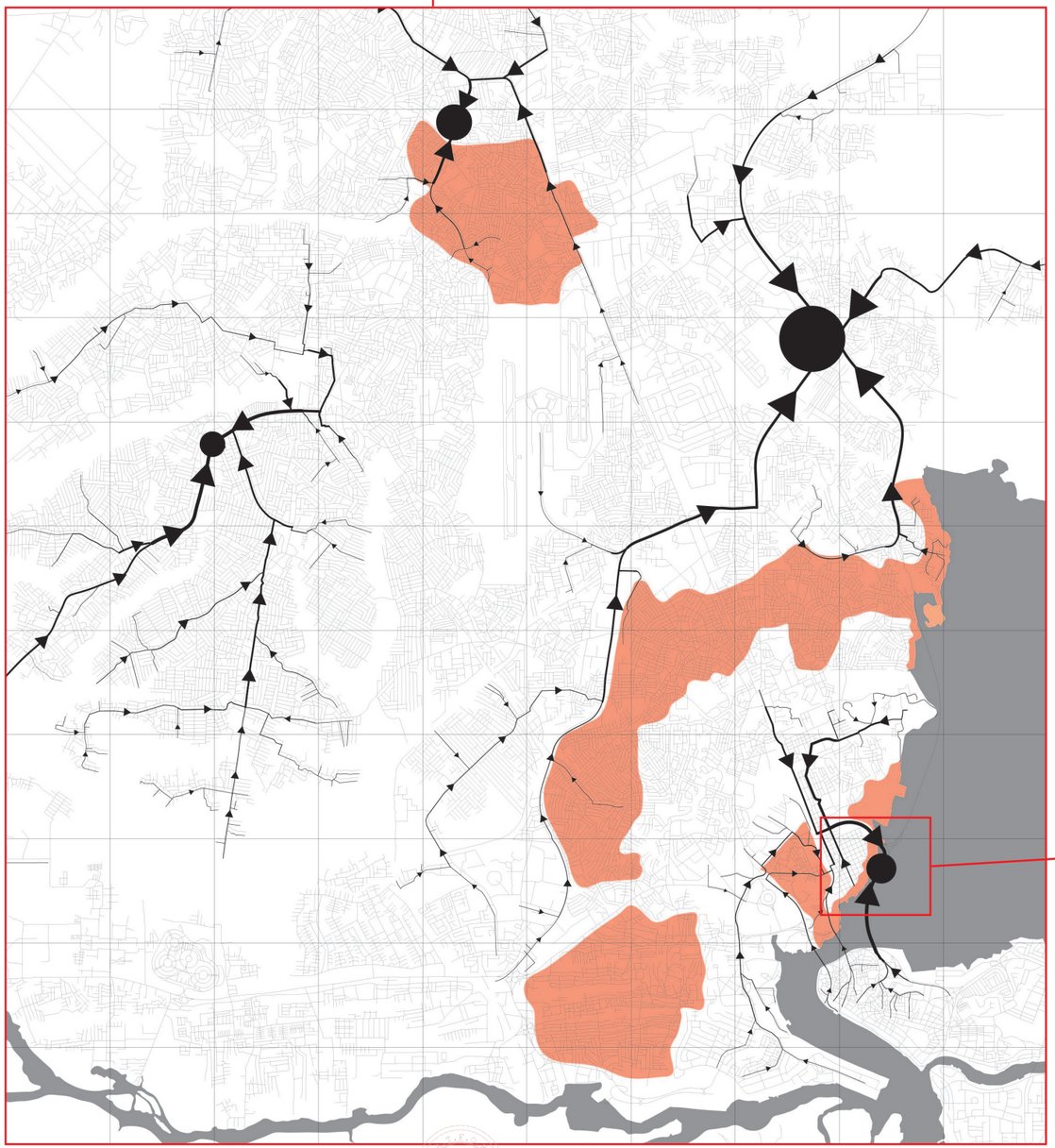
The Badia slum is the opportune site to investigate the potentials of the slums and attempt to balance issues of sea rise, population density, and waste management. The site is along a major garbage route. The water is shallow, and the barrier can be supported by the existing infrastructure of the highway bridge.

Fig.13 The proposed dumpsite near the slums. This site provides employment for slum dwellers and intercepts the existing routes.

Slums

Sea Rise

Site

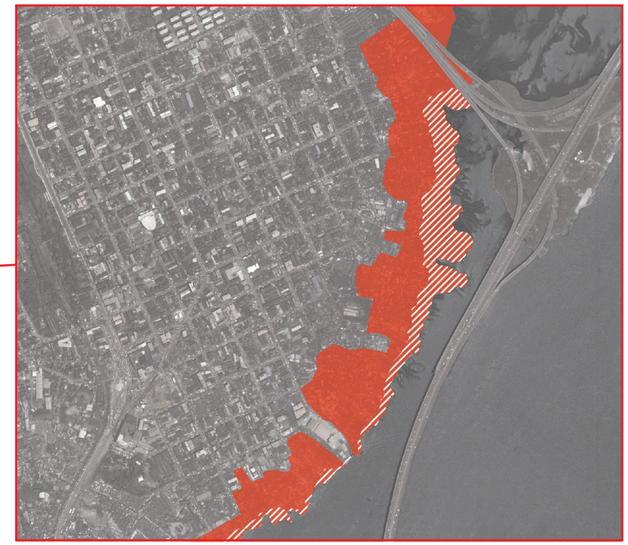


III.A.3 Proposal

This thesis proposes a formalized trash dumping facility along Third Mainland Bridge, a major piece of transportation infrastructure, that would act as a cut-off between the urban center of Lagos Island and the official dumpsites in the north.
The facility would provide trash sorting industry, land accumulation possibilities, a defensive barrier against sea rise, and reduce contamination of coastal waters.

Fig.14 Proposed dumpsite along Third Mainland Bridge.

Fig.15 Site detail. Slum in relation to bridge.



Dumpsite
Dumping Routes
Slums

P.L.A.T.F.O.R.M.
Brian Lee 2012
III.A.3. Intent: Proposal

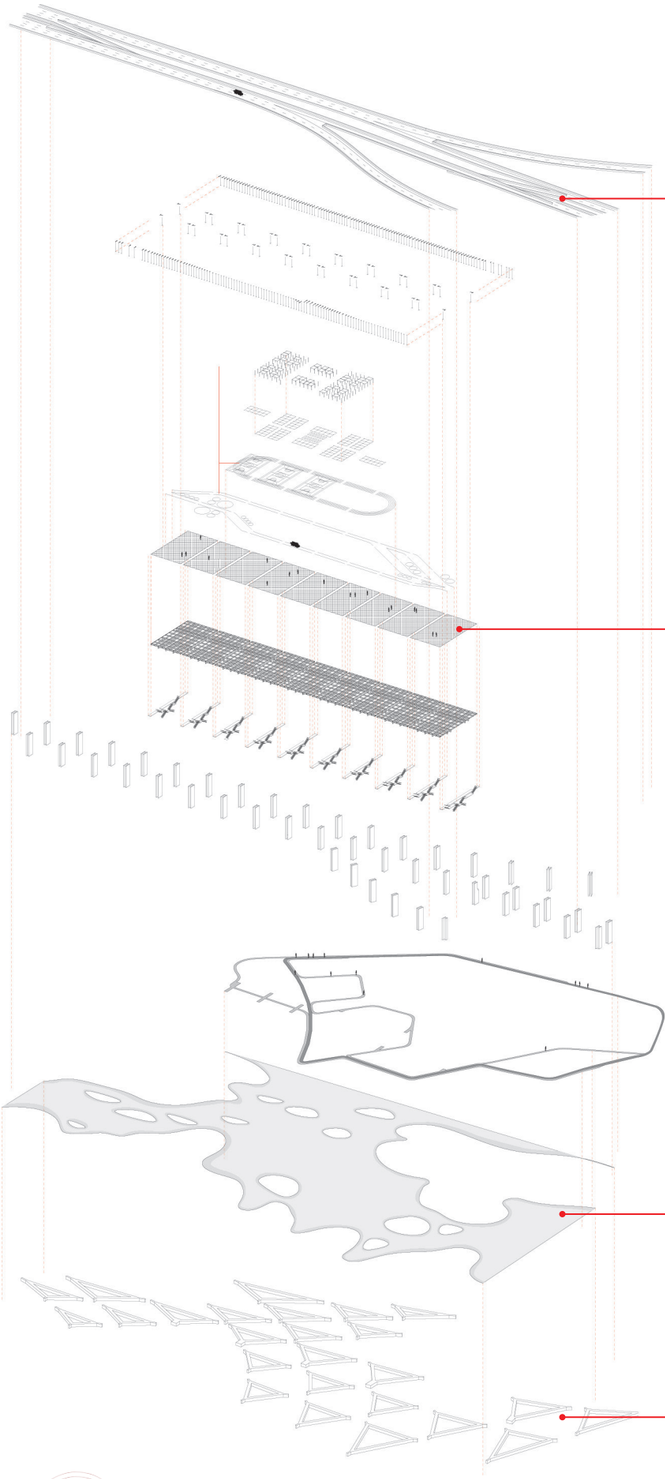


Fig.16 Exploded Axonometric of P.L.A.T.F.O.R.M.

III.A.3 Proposal

A platform constructed under the highway bridge would act as a connection between the transportation infrastructure and the existing trash routes, and the residents of the coastal slums. Ramps would bring trucks down to the platform upon which dumping and sorting would take place. Slum dwellers would have access to the waste resources passing along the roadway bridge. These resources would allow for new commercial endeavors in the coastal slums and the dumped waste would provide the mass for a coastal defense system.

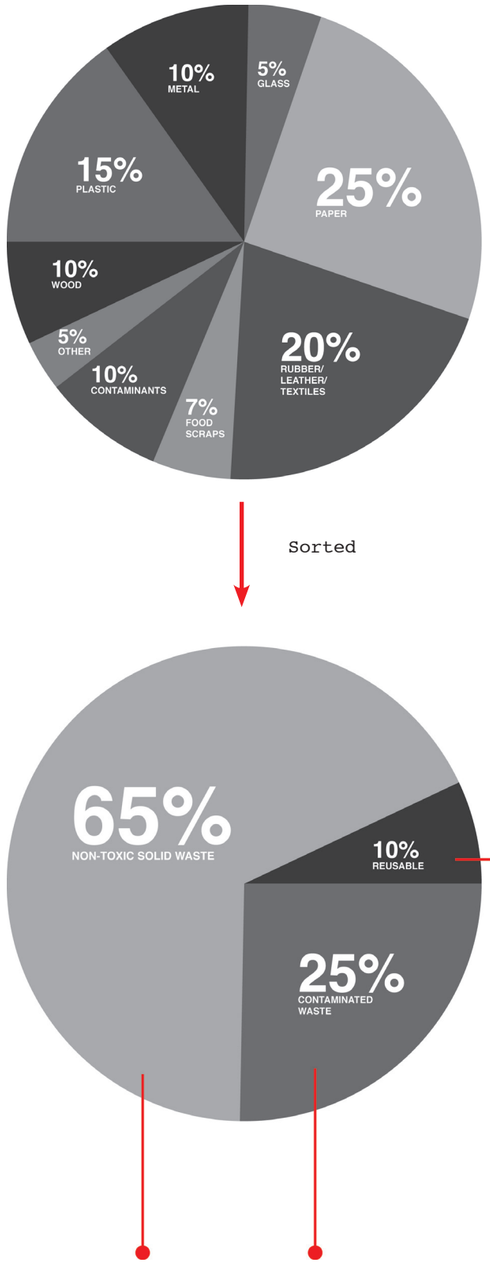


Fig.17 Garbage Composition and Distribution at P.L.A.T.F.O.R.M.

III.A. Proposal

The dumping and sorting facility of P.L.A.T.F.O.R.M. would allow for the organization and containment of waste utilizing the existing practices of trash sorting and land accumulation. Waste will be separated into three types: re-sellable material, solid non-toxic waste, and contaminated waste. These elements will respectively provide goods for commerce, supply the required mass to construct a coastal defense, and be contained and treated.

III.B Defense

III.B.1 Lexicon

Of the existing techniques of coastal defense, each has its own attitude toward existing ecological systems. Types both resist and cooperate with nature. Each system requires certain conditions to be successful. This proposal will use a hybrid defense system, integrating aspects of many of the existing systems. The hybrid model would embrace ideas of beach nourishment, include characteristics of a module, and create a barrier sufficiently strong to resist rising water. The hybrid model will manage contaminants in waste as well as providing a coastal defense.

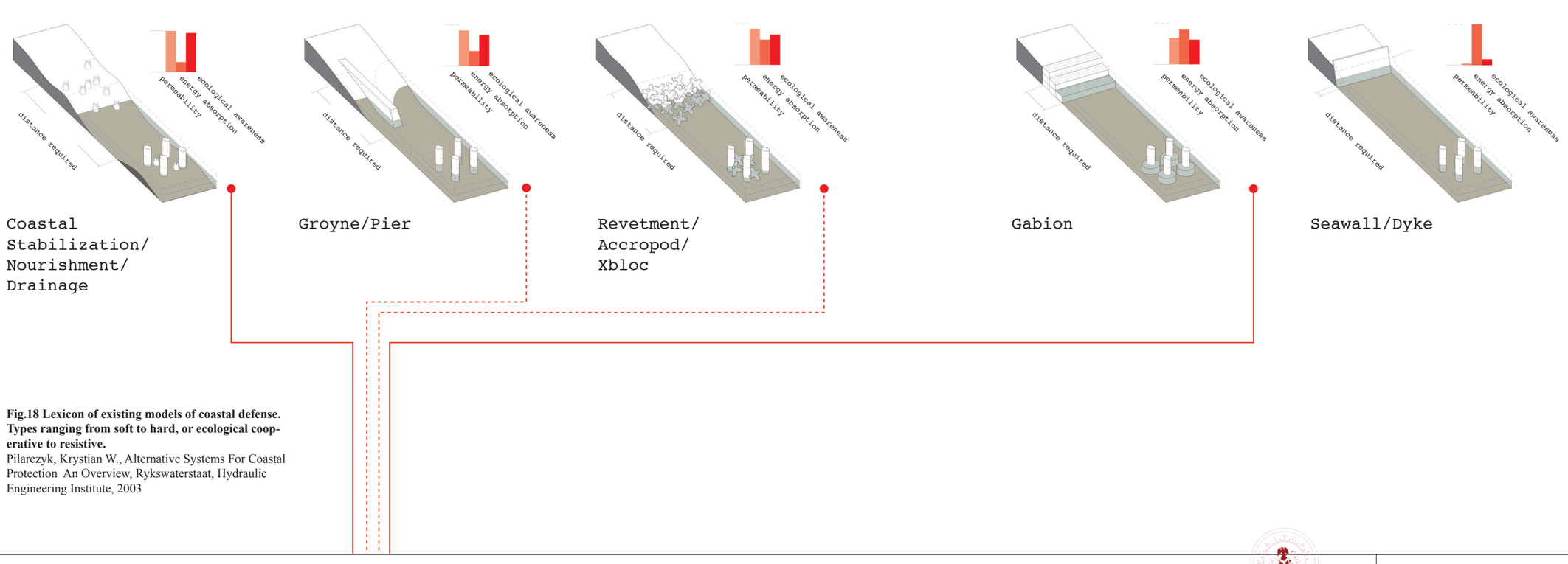


Fig.18 Lexicon of existing models of coastal defense. Types ranging from soft to hard, or ecological cooperative to resistive.
Pilarczyk, Krystian W., Alternative Systems For Coastal Protection An Overview, Rykswaterstaat, Hydraulic Engineering Institute, 2003

III.B.2 Module

A hybrid defense system made of trash-filled gabions would allow for the disposal of garbage, containment of toxins, and the establishment of a barrier to protect the coastal slums from sea rise.

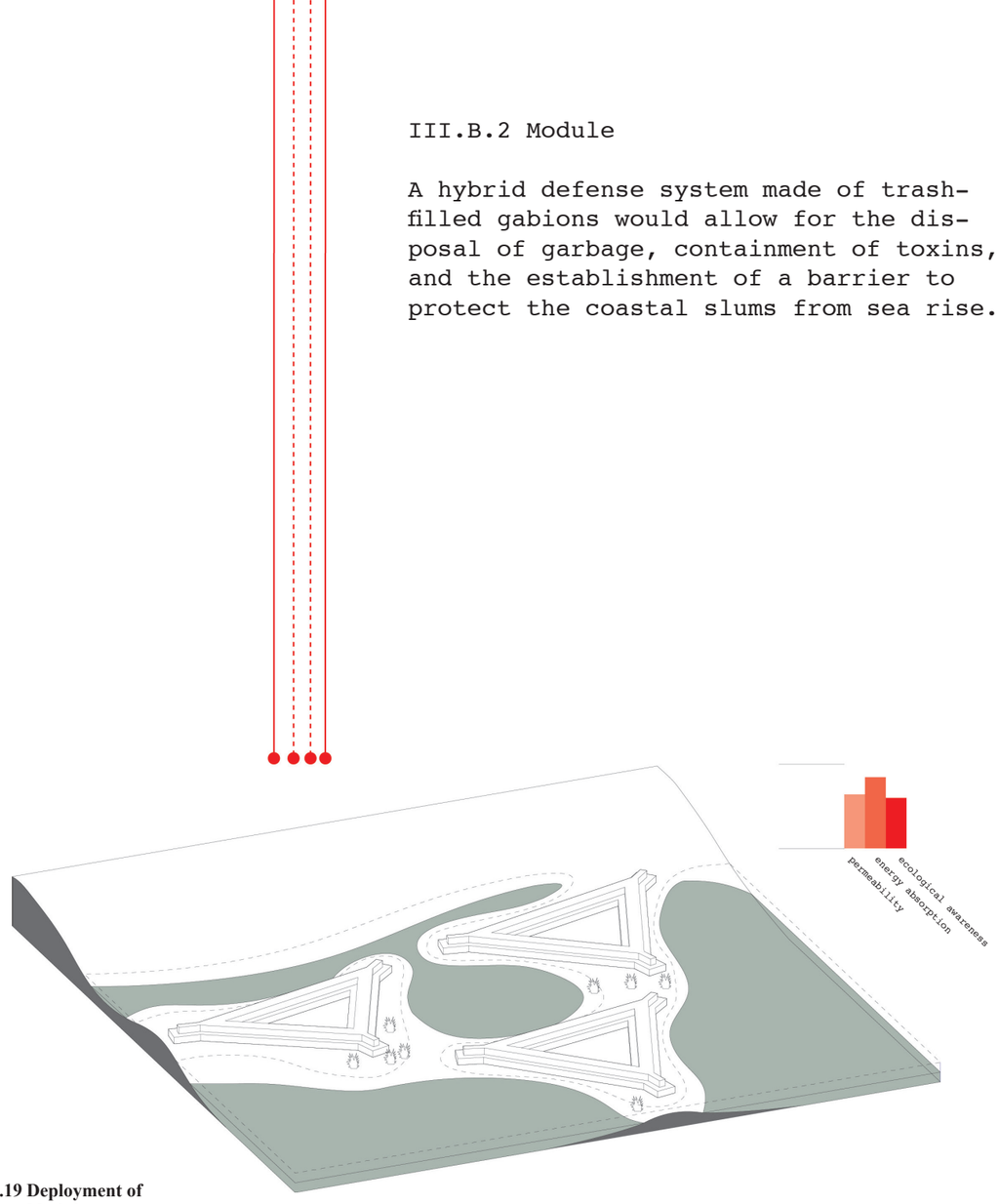
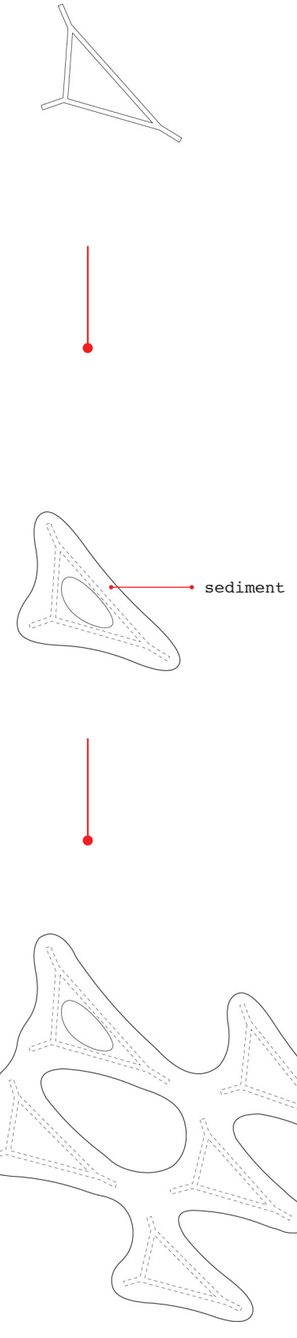


Fig.19 Deployment of Waste Module.



The triangular geometry provides structure to the module and facilitates two processes. First, a closed unit allows for the containment of toxins and contaminated waste which are dumped within the center. Second, the module can collect and retain passing sediment, dumped garbage and sand. As sediment accumulates vegetation will grow and remediate contaminants, cleansing the water within the interior pools.
Furthermore, expanding through sediment accretion allows the modules to become a frame work for a defense against rising coastal waters.

Fig.20 Formation of Waste Module Network.

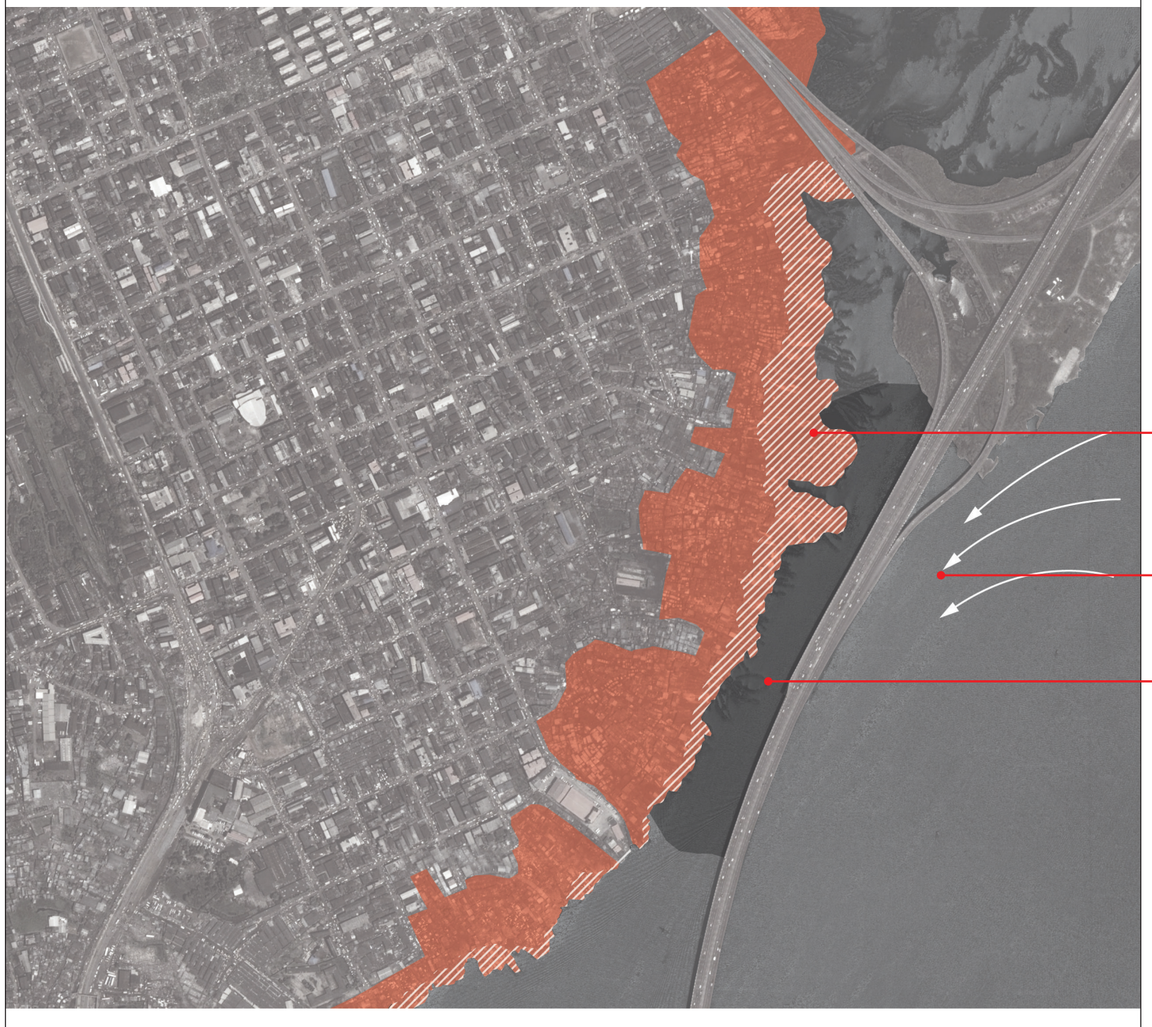
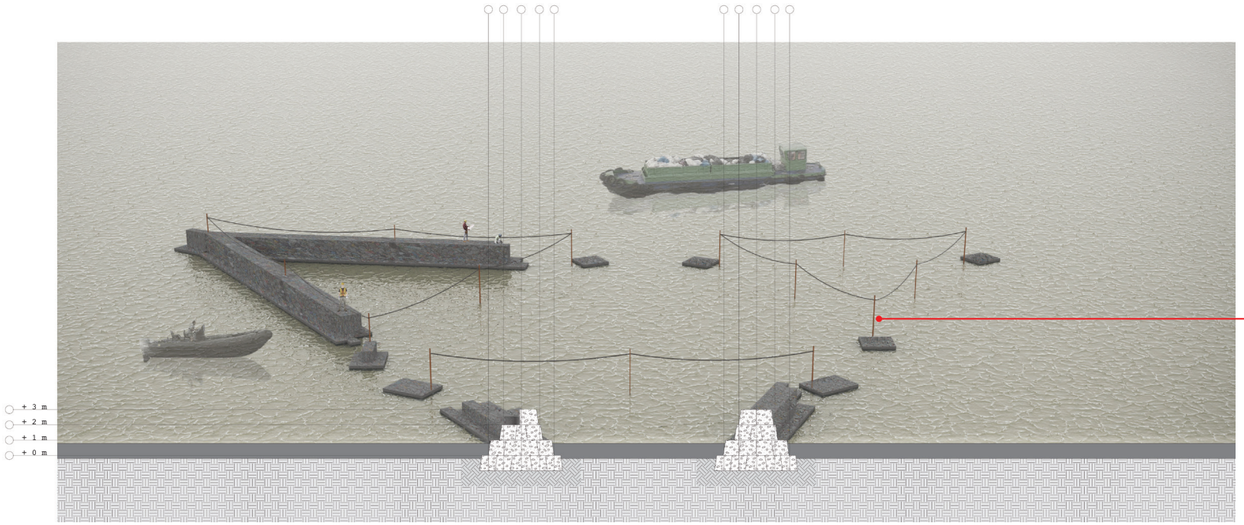


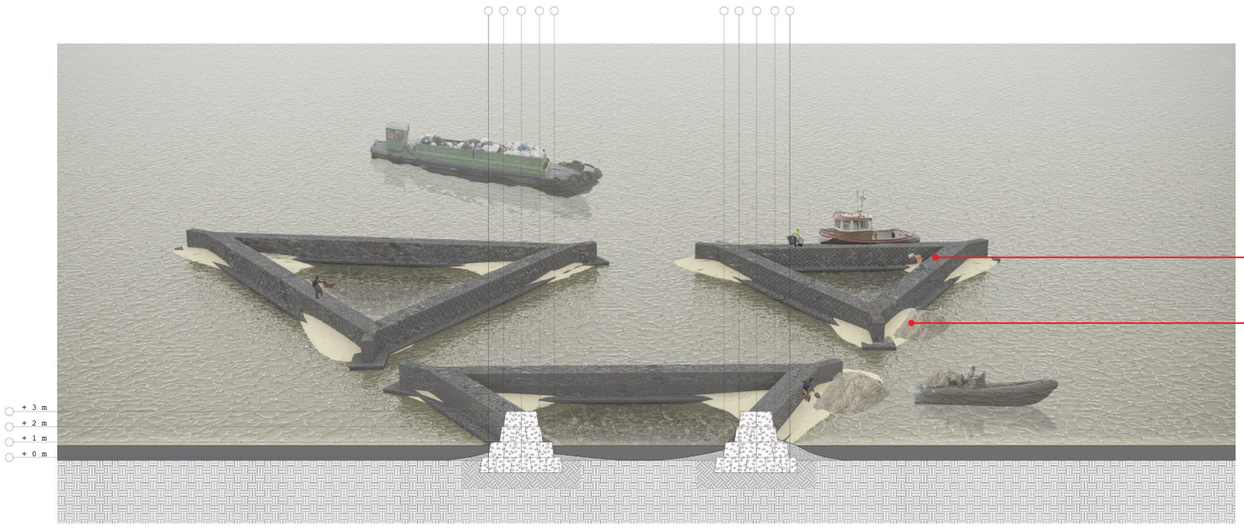
Fig.21 Trashscape site and currents.

Deployment of the module would capitalize on the proximity of Third Mainland Bridge and the coastal Badia Slums, acting as cut-off to the hard infrastructure of the bridge to consolidate waste on site. The network of modules would use the existing structure of the bridge as an initial support and the shallow water around the site would allow for the greatest proliferation of the system. Additionally, passive accretion of sediment could occur as water from Lagos Lagoon flows to the Atlantic Ocean.



Solid waste gabion assembled on platform and placed into defensive module pattern.

Fig.22 Initial module construction.



Dumping of contaminated waste within the contained gabion.

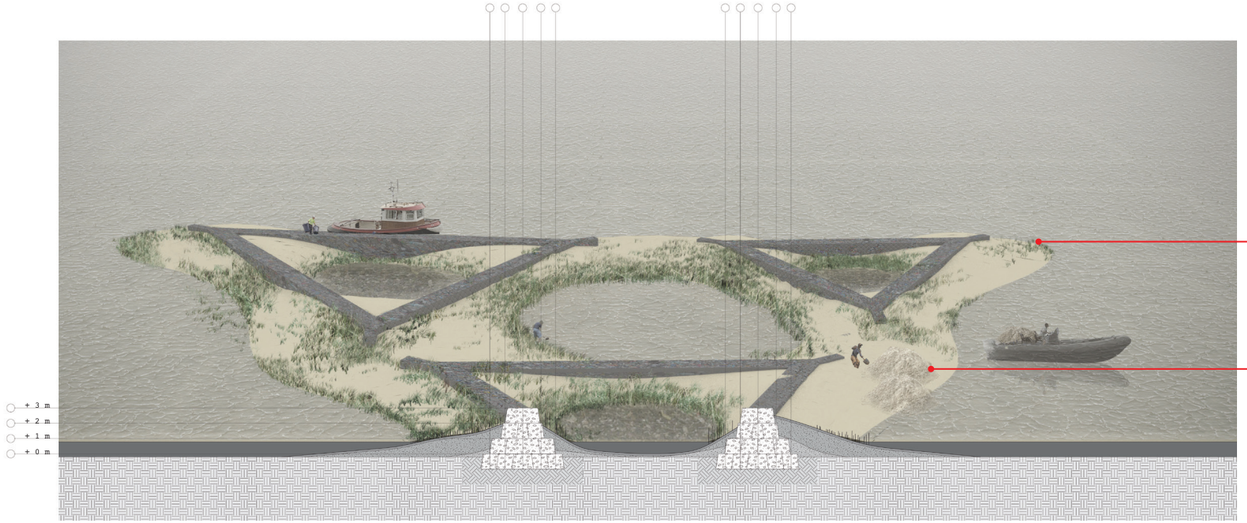
Sediment accretion and sand dumping for planting of remediating vegetation.

Fig.23 Early dumping and sediment accretion.

III.D. Trashscape

III.D.1. Deployment: Initial

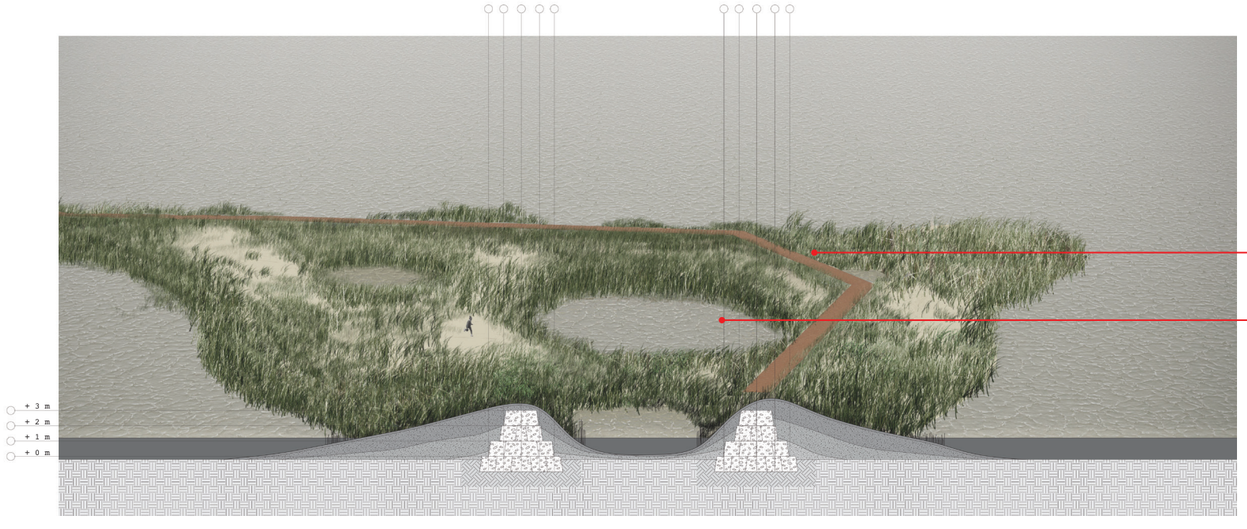
As waste is sorted and collected, gabions of compacted trash would be organized in a pattern cohesive with coastal protection techniques in order to maximize energy absorption and sediment accretion.
Solid, non-toxic waste would make up the mass of the gabion, establishing a framework for future dumping. As the network gained strength and stability passing sediments would accrete along the modules' edges.



Remediating plants remove toxins from dumped garbage.

Sediment accretion and sand dumping for planting and sea rise barrier.

Fig.24 Initial planting and continued sand and sediment build-up.



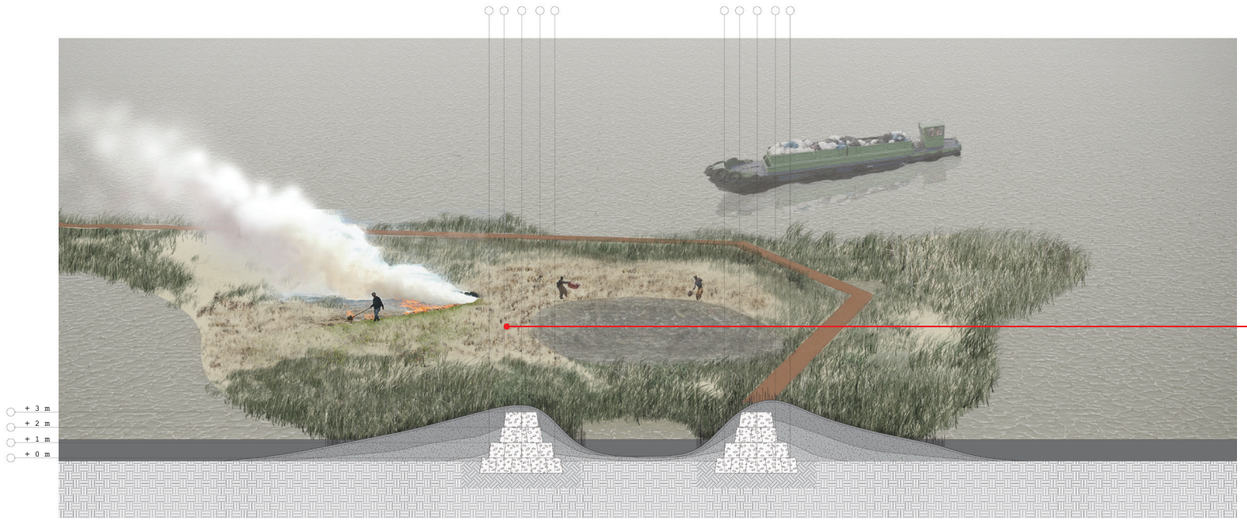
Circulation along the gabion network.

Clean water as a result of bio-remediation. Remediating plantlife continue to remove toxins from water and soil.

Fig.25 Mature wetland and surface circulation.

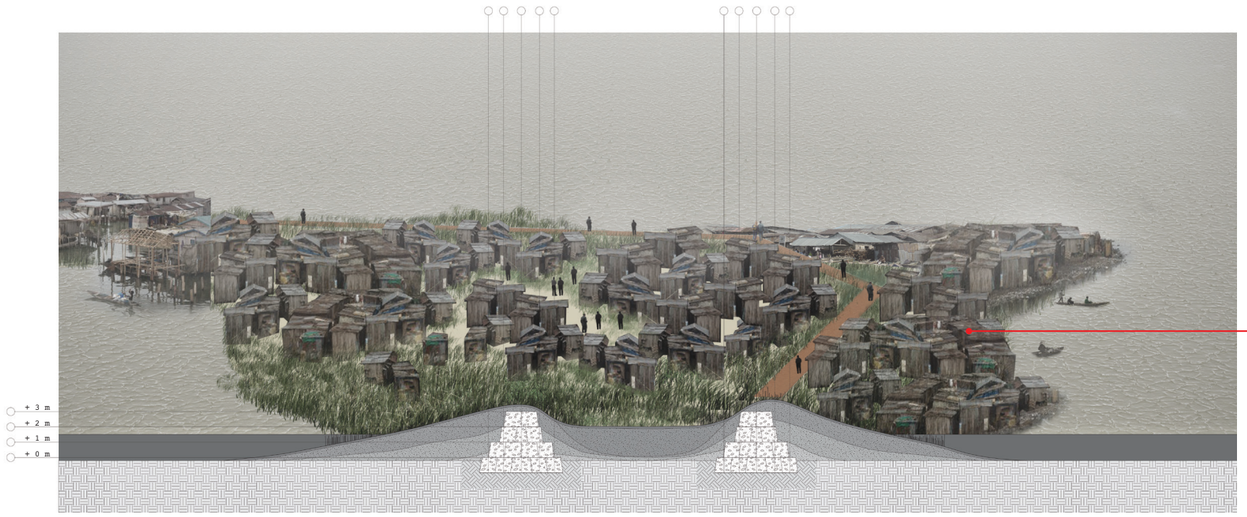
III.D.1. Deployment: Development

As sediment accretion and sand dumping continue, the modules begin to join and allow space for plant growth. The vegetation on the modules adds support to sediment and would begin to remediate the water in the central pools that would be contaminated by dumping. The smaller pools within the triangles would begin to fill in with garbage and sand and the role of filtration would shift to larger pools formed at the intersections of modules. Added support from the vegetation, waste, and increasing sediment also fortifies the sea rise barrier.



Burning of toxic plant life after remediation and clearing of land for slum habitation.

Fig.26 Land clearing and toxin removal.



Slum habitation and coastline expansion. Completion of coastal protection barrier.

Fig.27 Expansion of slums.

III.D.1. Development: Reuse

As the water in the interior pools becomes remediated the toxic vegetation would be burned. The module surface now becomes a programmable space allowing for the expansion of the slum settlements in addition to providing the necessary mass and strength for protection against rising water.

III.C.2
Plan Phasing

The initial array of the gabion network exploits the geometry of the module using an orientation opportune for passively accreting sediment from the passing currents. The modules congregate under the passing bridge to facilitate and simplify the transport of waste from the roadway to the lagoon bottom.

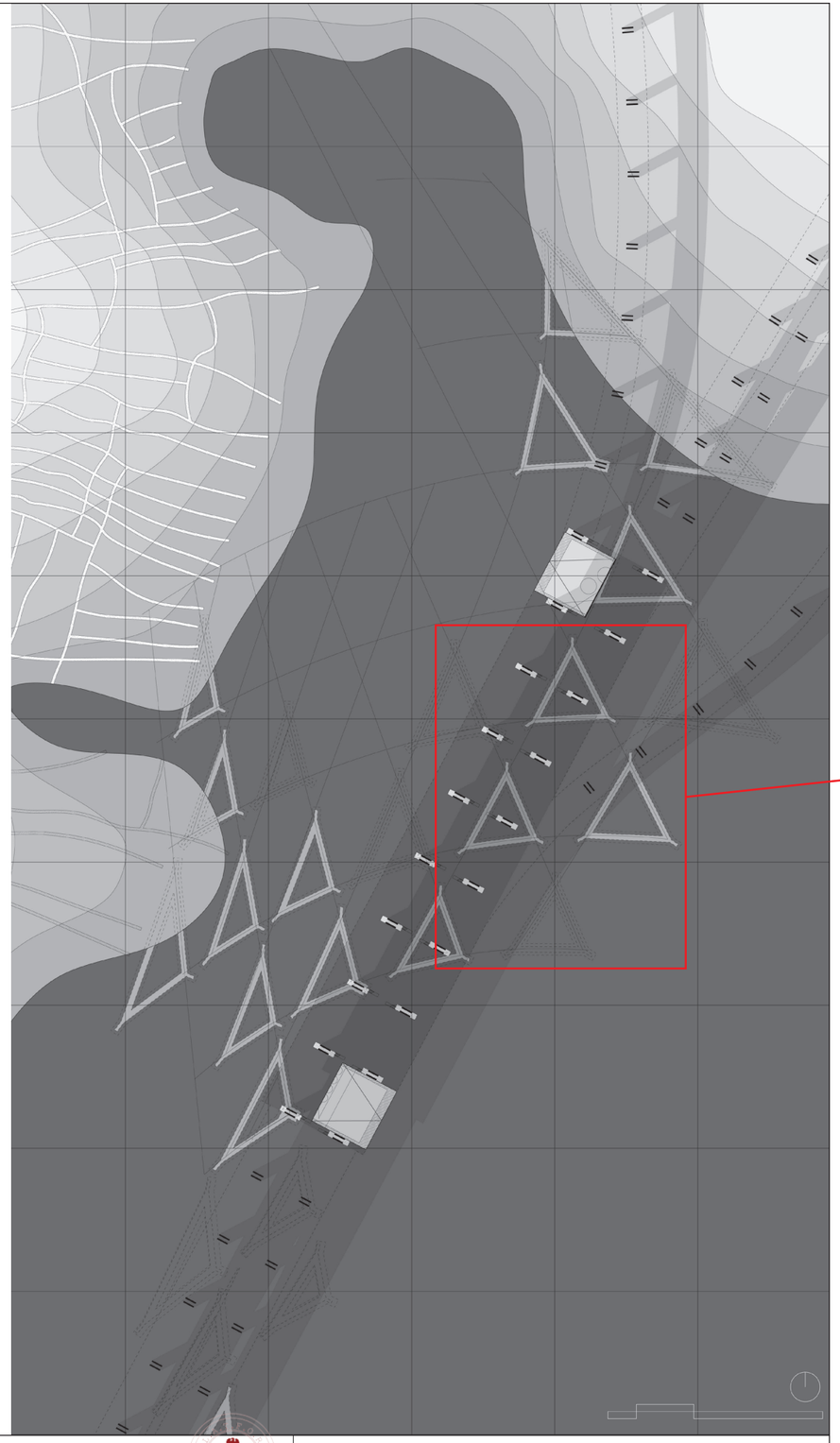
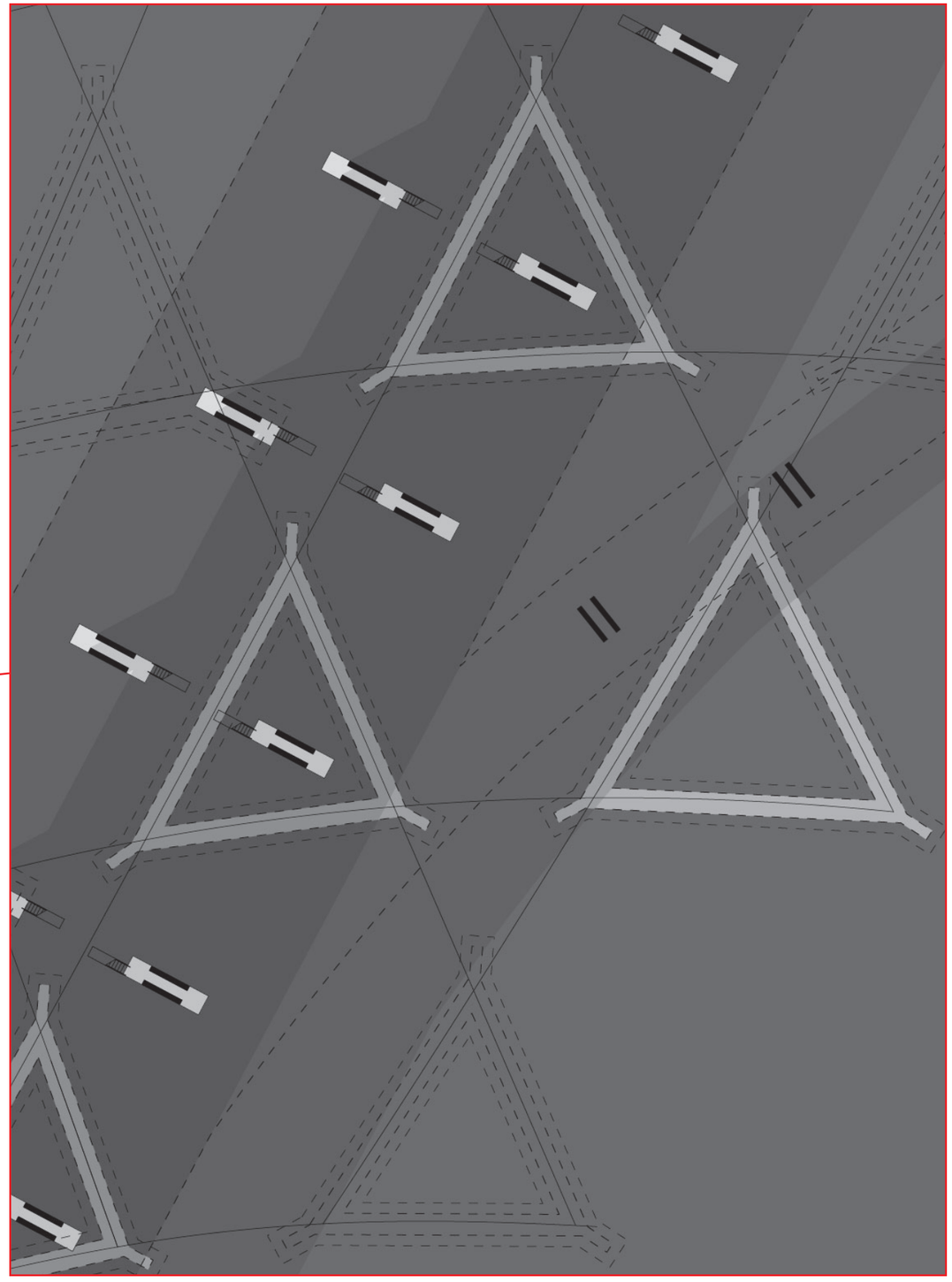


Fig.28 Initial Deployment Network



As the system continues to grow, cleansing pools would be filled with sediment and waste. Connections develop between units. Growth of the system can occur as waste is strategically dumped throughout the system. As a surface is form remediating plant life could be grown and the network could act as an intelligent ecological system of filtration and waste management.

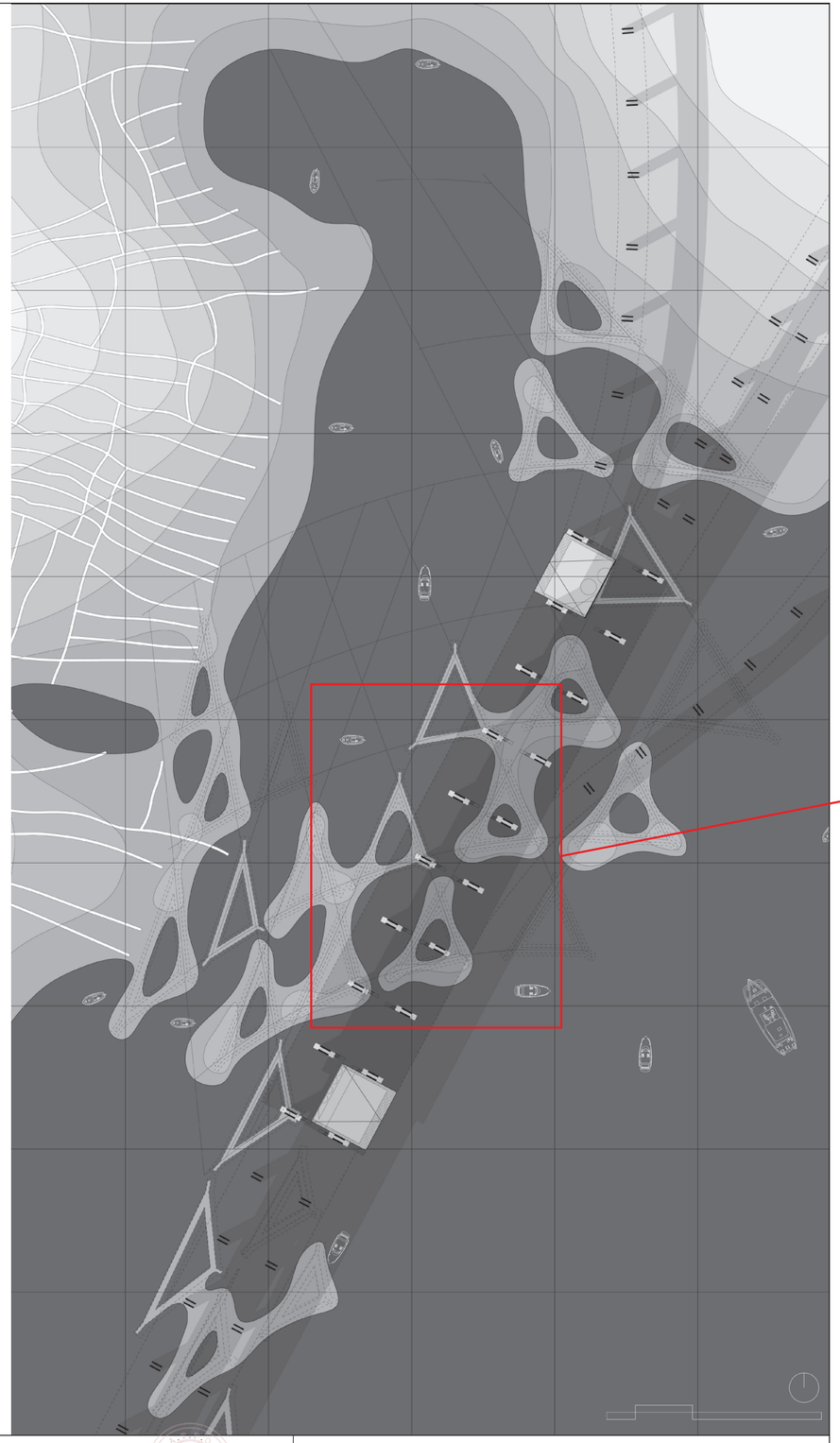
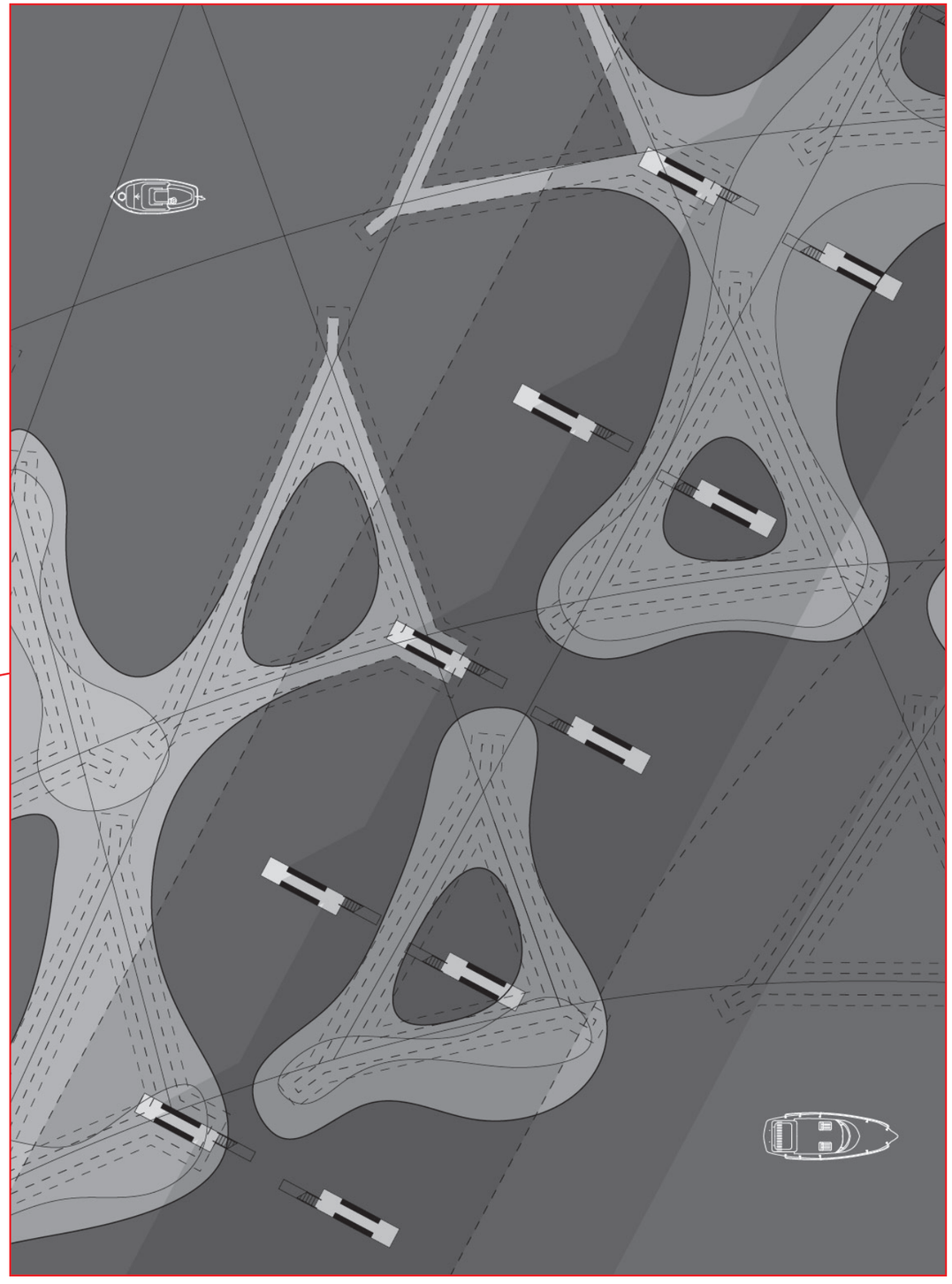


Fig.29 Early Dumping and Accretion.



Continued accretion and sand dumping allow for larger programmatic surfaces to form. Initially this surfaces would act as working spaces for waste collection and dumping workers, however, as the system evolves these spaces would become amenities to the slums, as public spaces or simply as expansions to the dense housing.

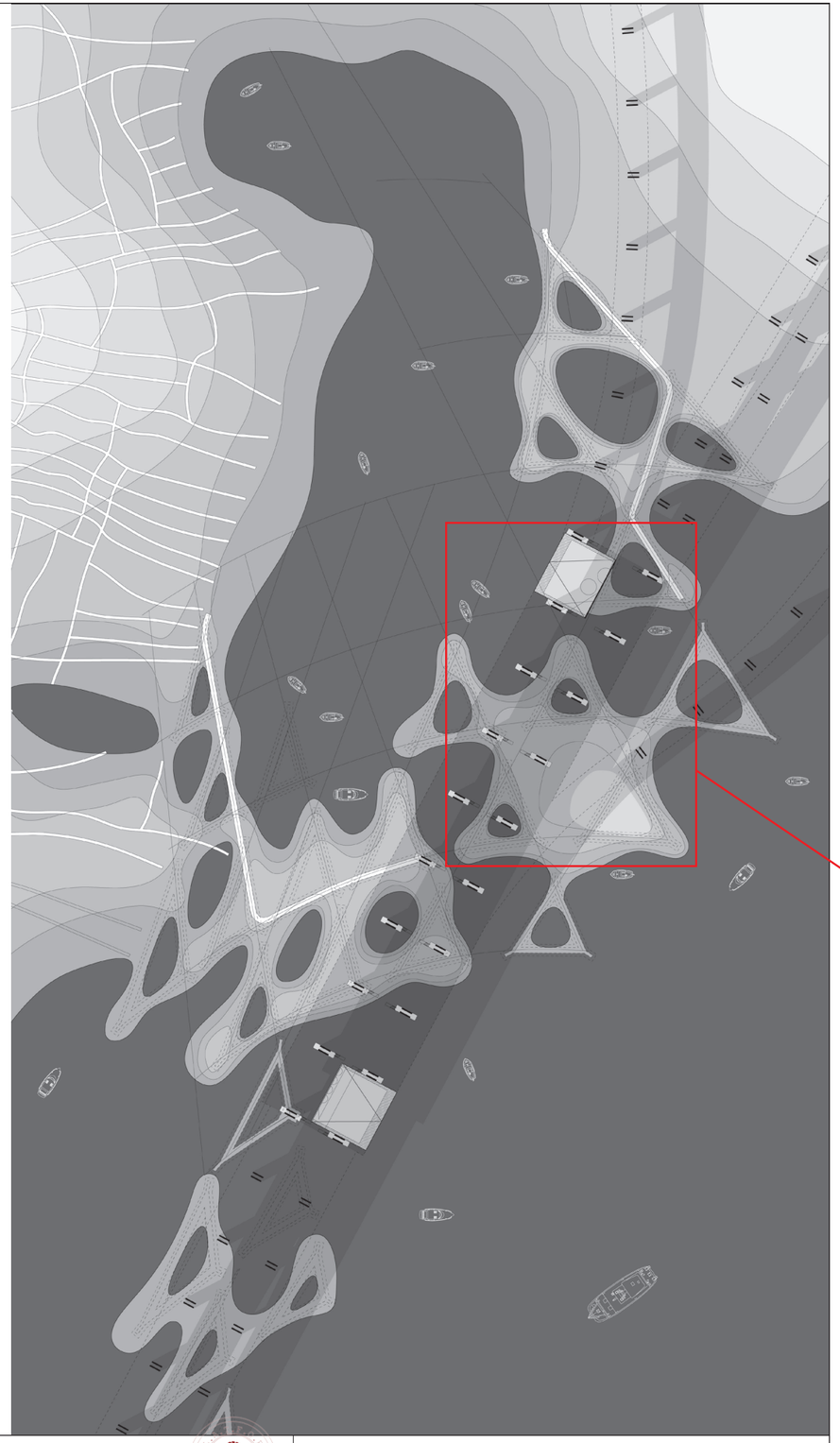
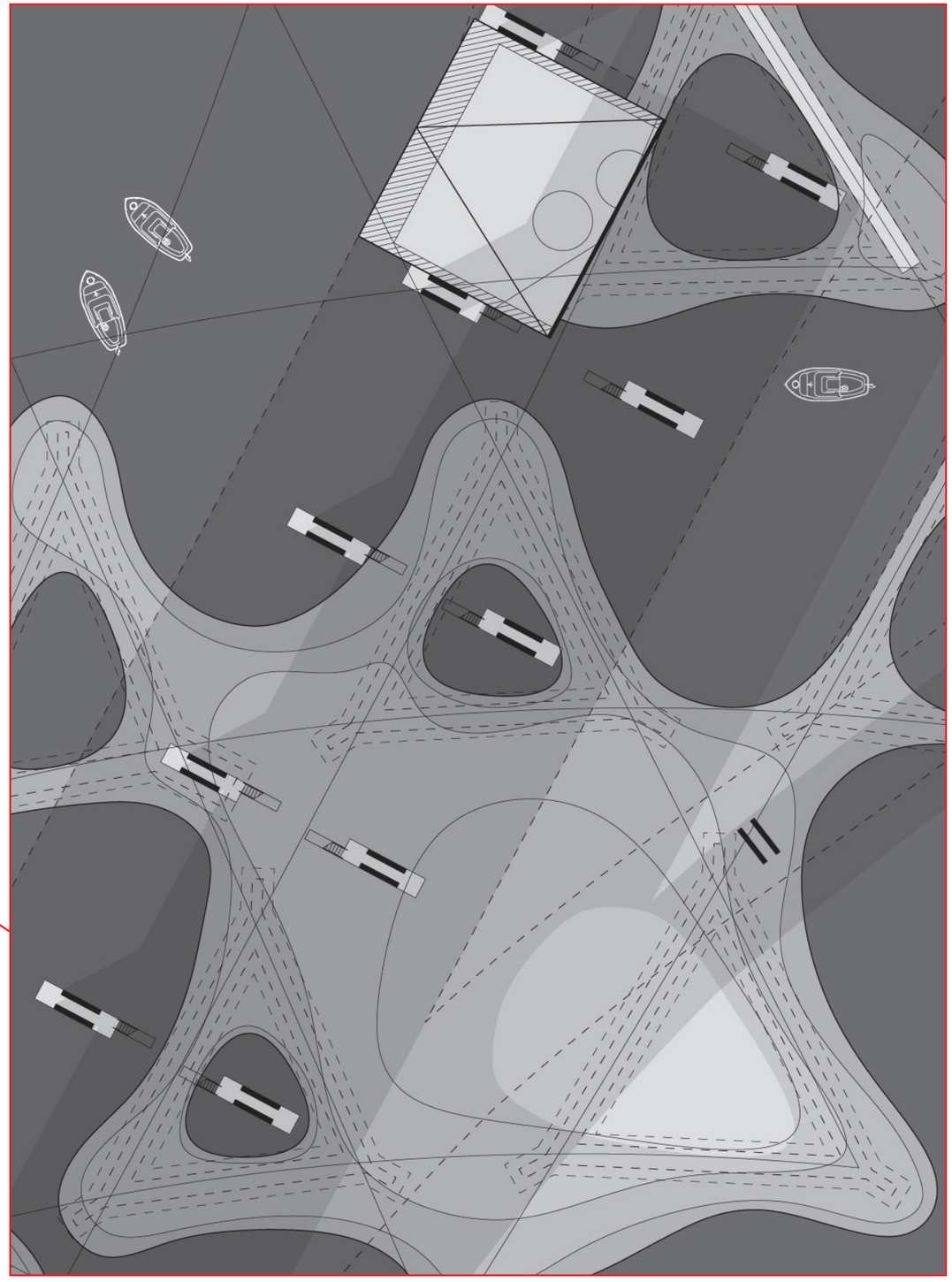


Fig.30 Forming of programmatic islands.



With further growth, a definitive defensive line is formed, completing the coastal protection barrier. As gabions continue to shore-up sediment and retain sand, the network acts as a connecting element to the commerce and activity of the waste dumpsite and to the possible new programs of wetlands, public spaces and the repurposing of the above platform.

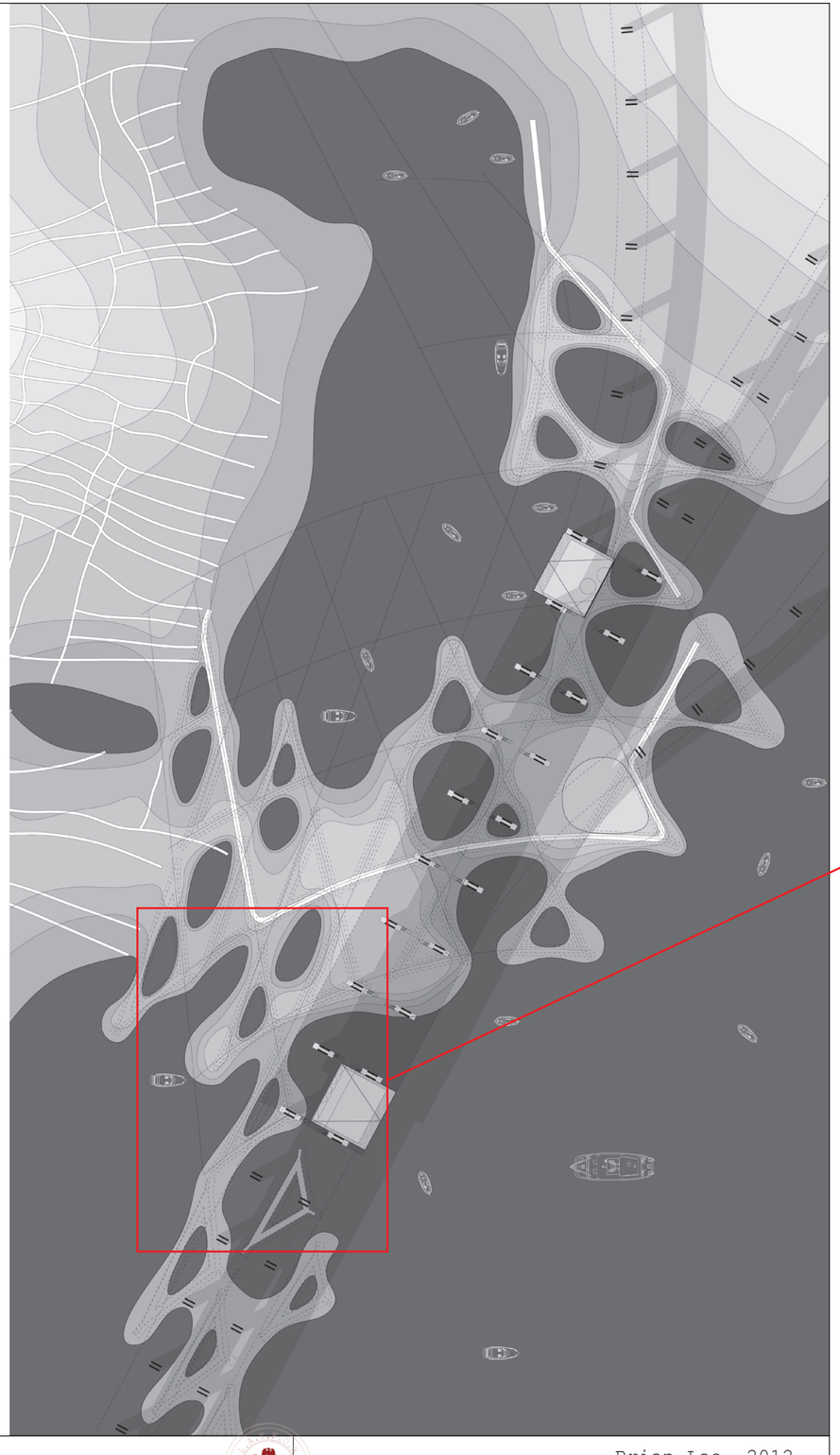
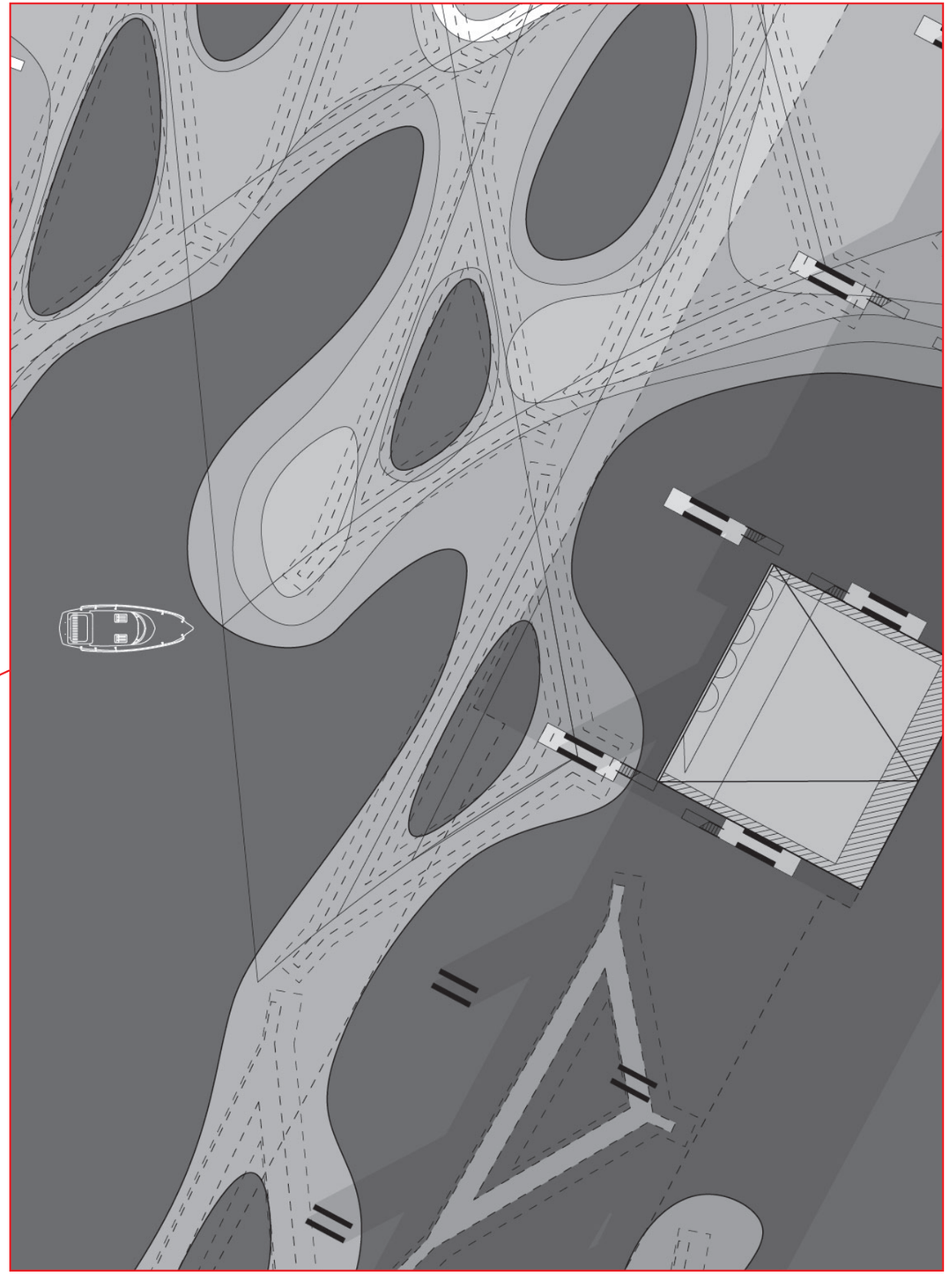


Fig.31 Completion of Defense Barrier.



New pools form between networks of modules. Contaminated water is cleansed through bio-remediation. The coastal protection system expands and increases as water level rises. Furthermore, the new surfaces of the gabion network can act as a port to serve the slums and the waste dumping facility.

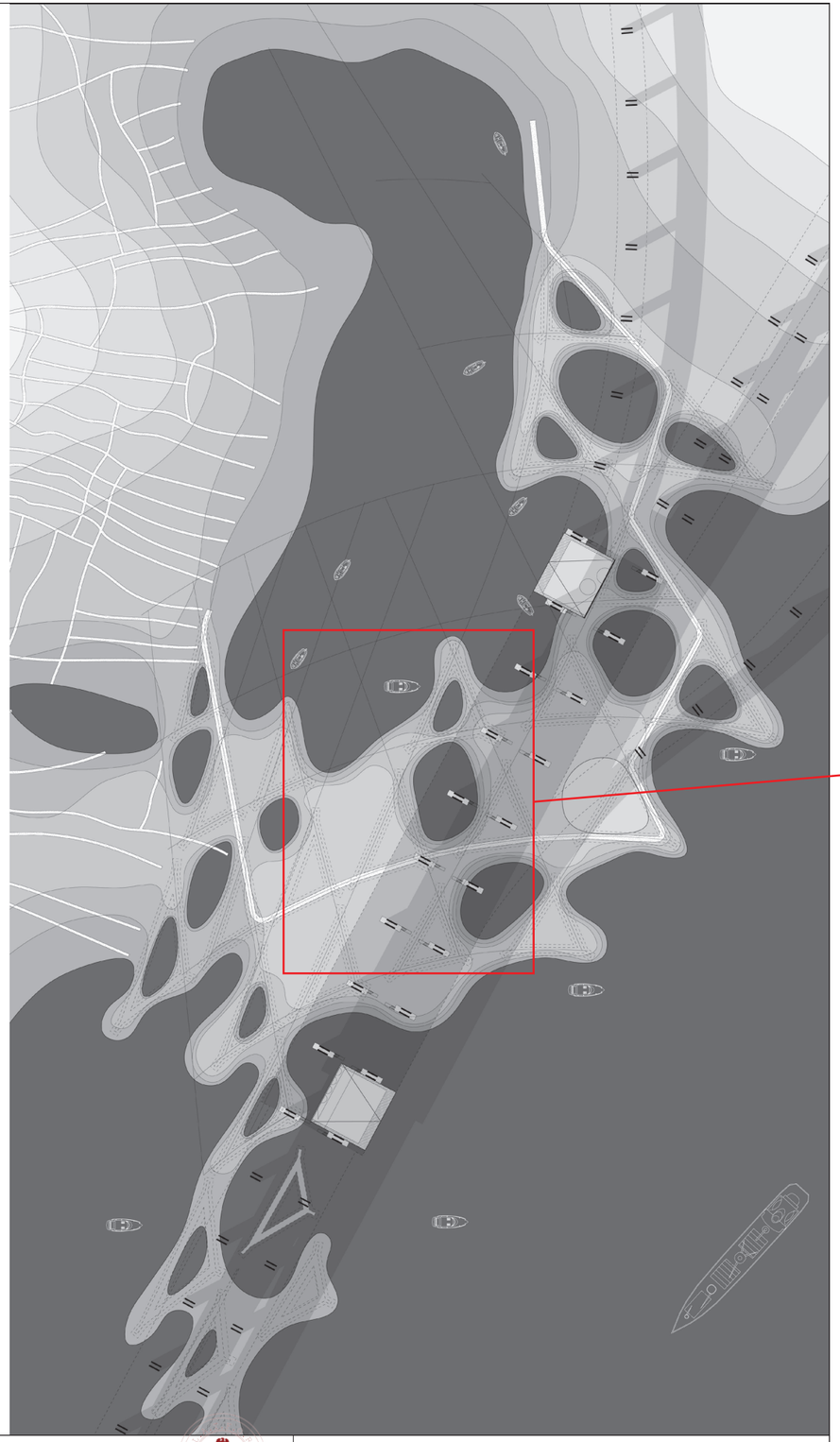
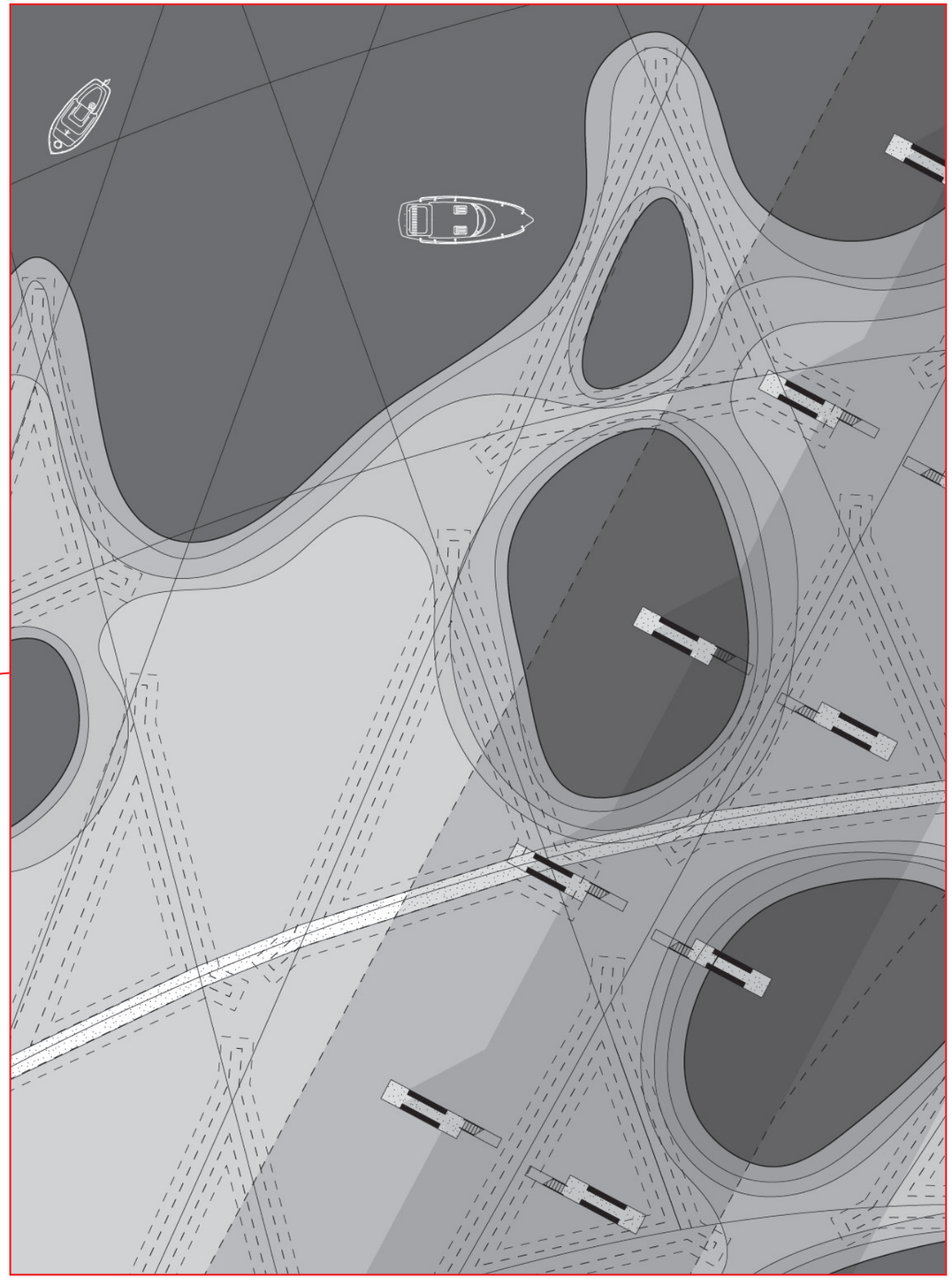


Fig.32 Beginning of Circulation Network



As the network fills in and trash is no longer needed in the slums, the role of the surface would shift from formalized trash dump to event space, urban park space, or additional commercial activity like aquaculture. Cleansed pools now act as a safe source of water.

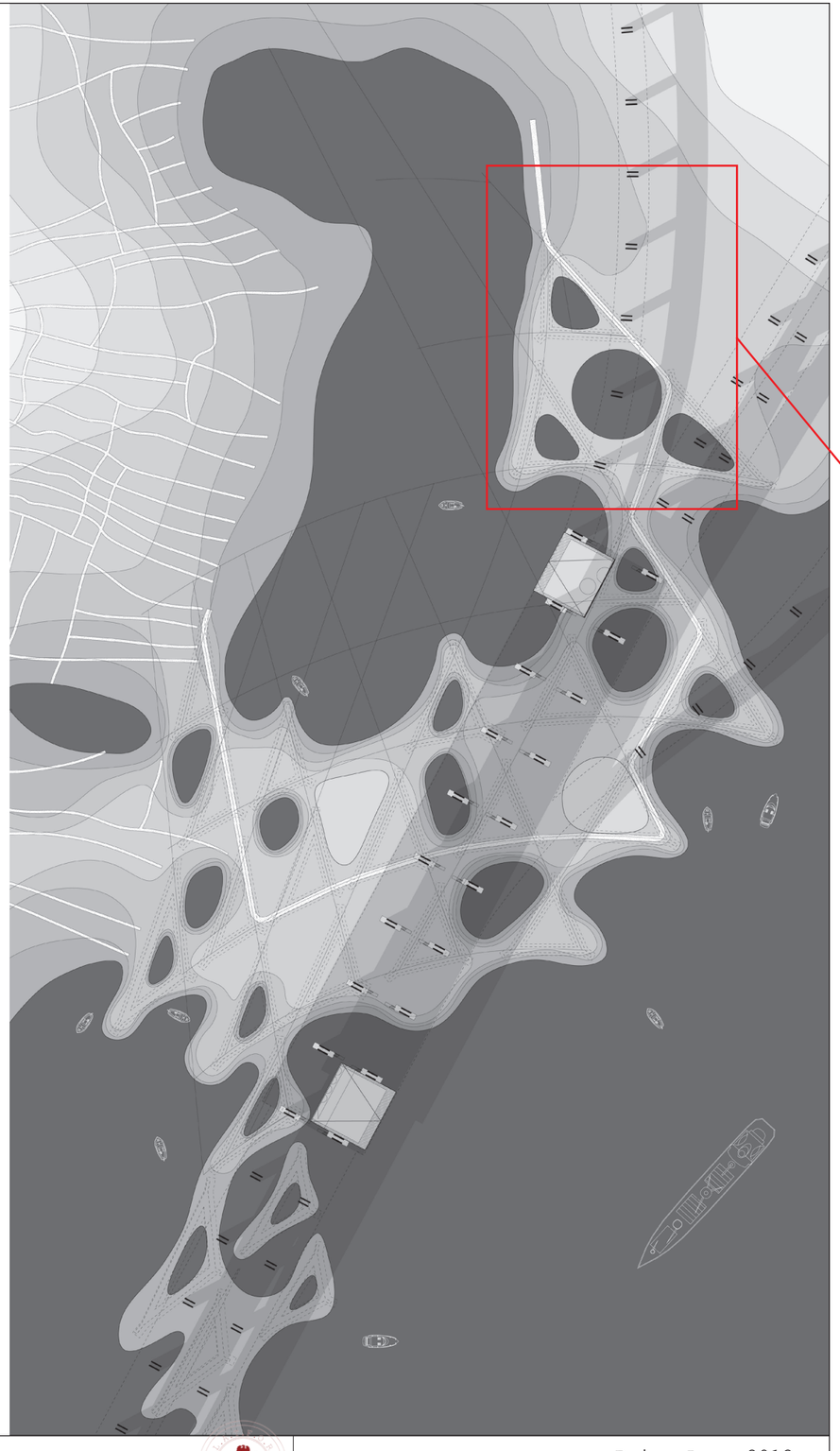
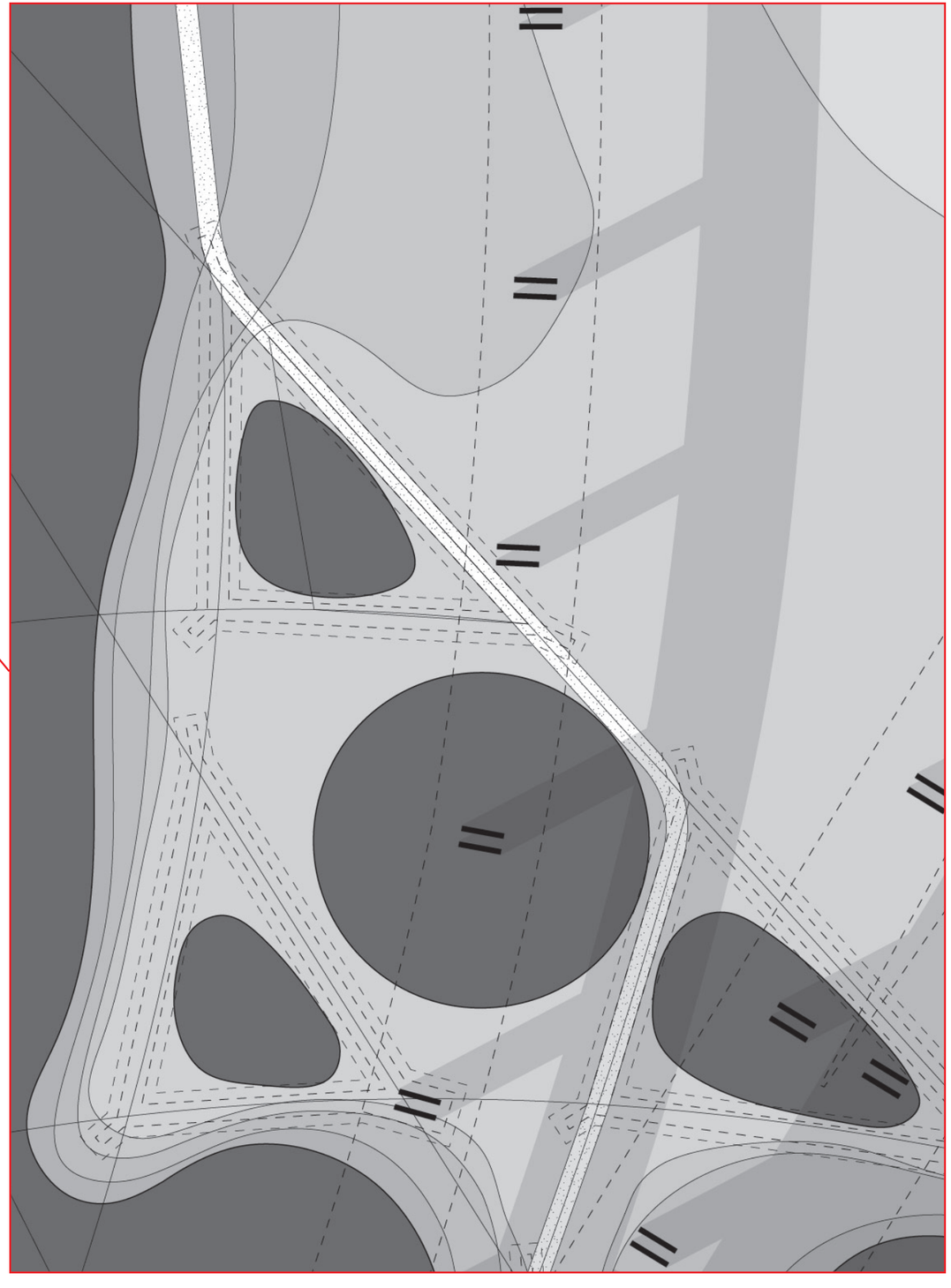
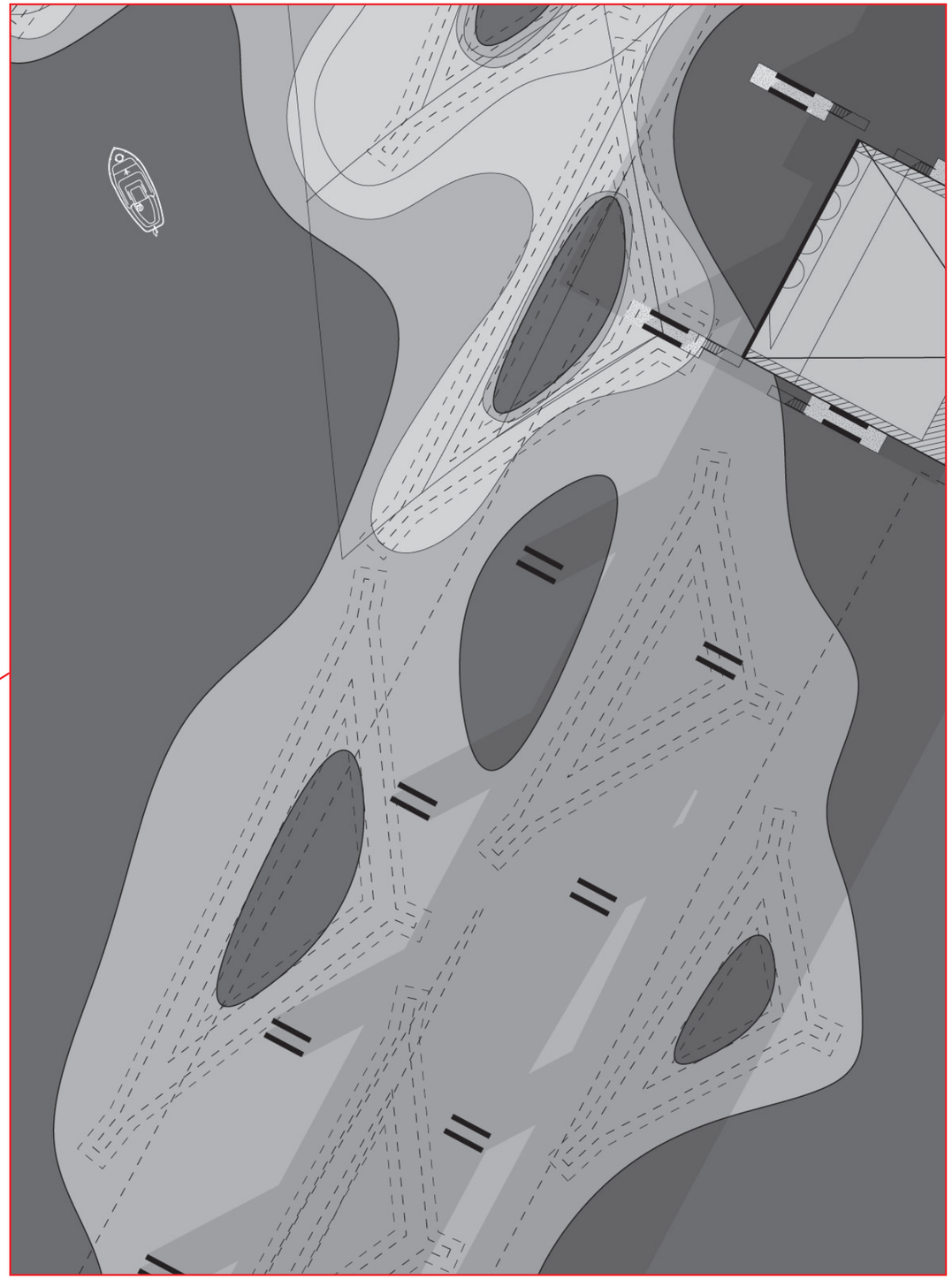


Fig.33 Expansion of slums.



The network continues to grow allowing not only for coastal defense and water cleaning but also for the programming of urban beaches, sport facilities, and possible housing.

Fig.34 Completion of Circulation Network and possible expansion.



P.L.A.T.F.O.R.M.

Brian Lee 2012

III.C.2. Trashscape

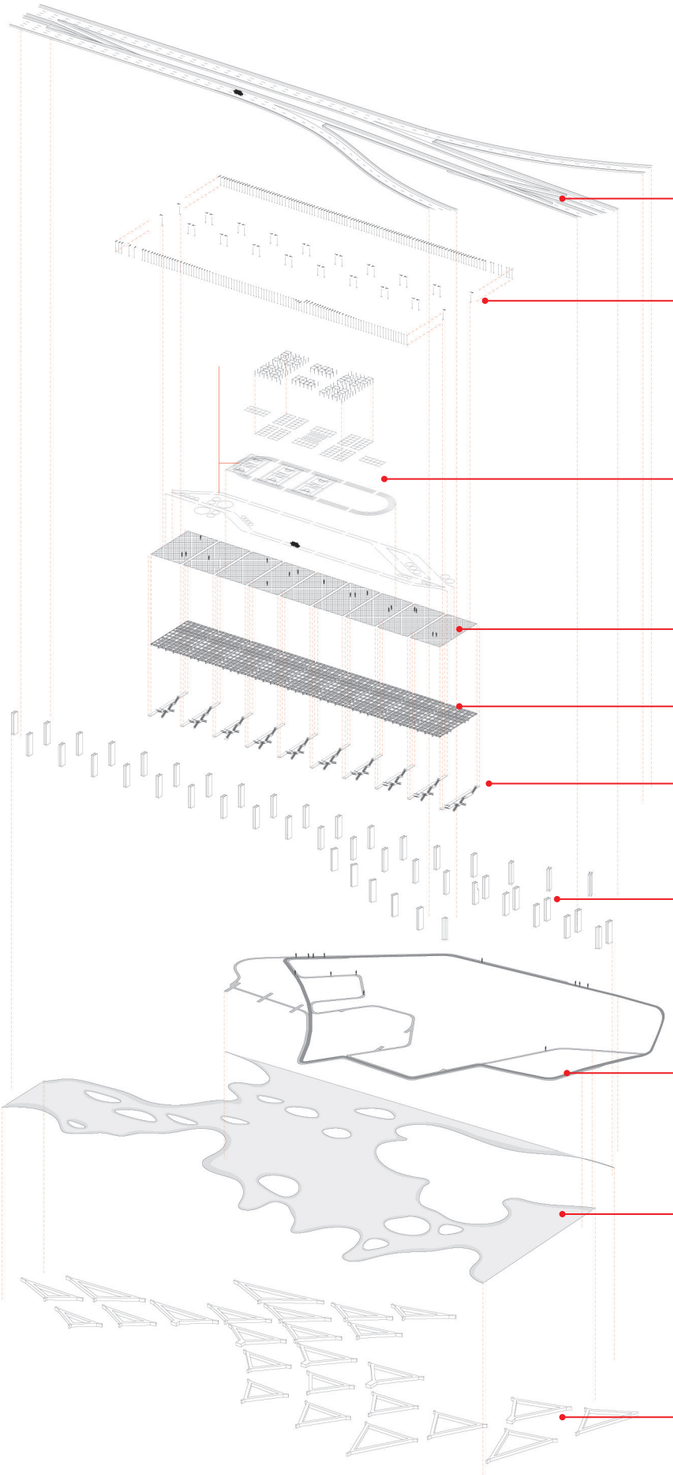


Fig.35 Previous Page: Lower Surface Rendering

Fig.36 Exploded Axonometric of P.L.A.T.F.O.R.M.

III.D. Platform

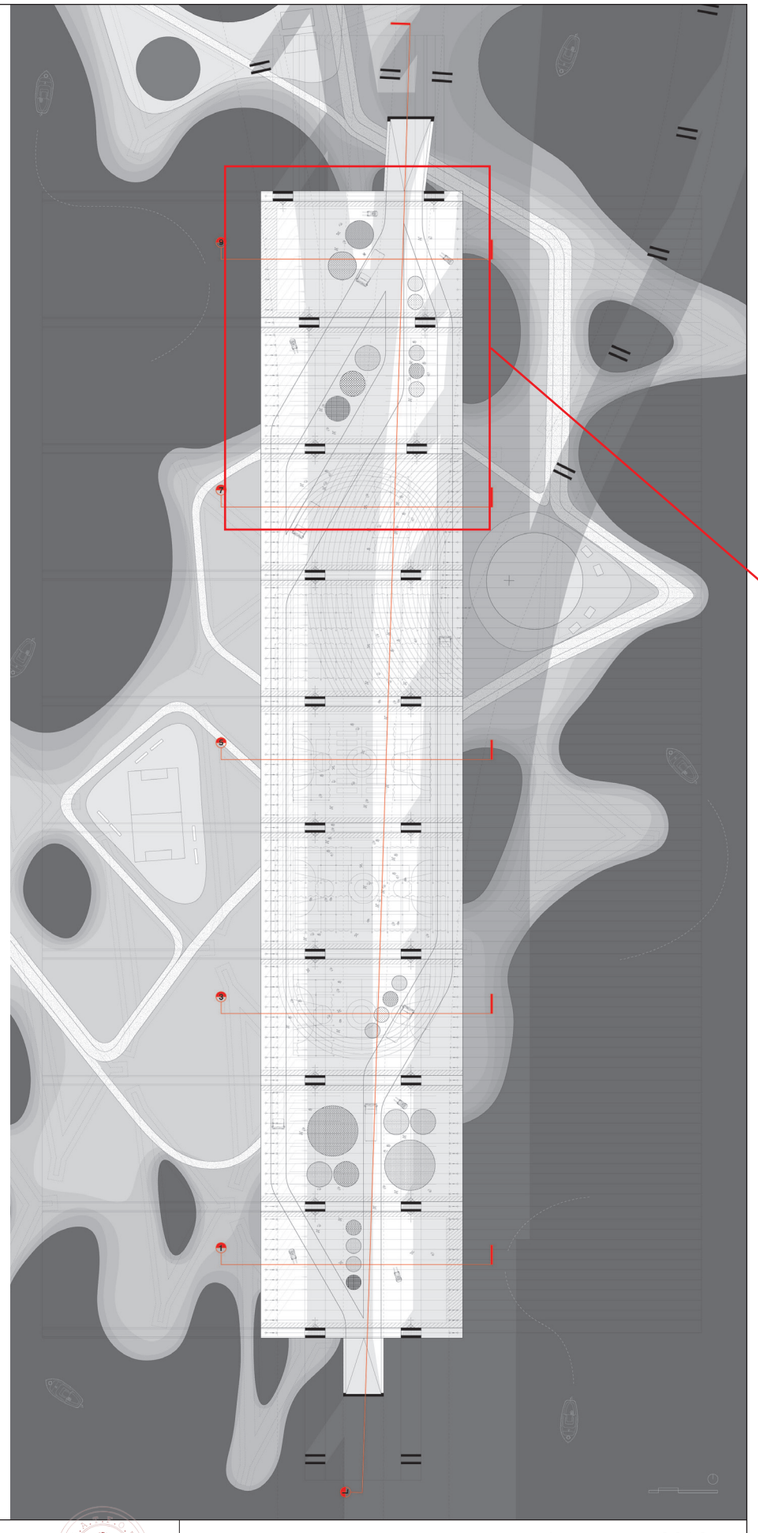
III.D.1. Axonometric

The platform constructed under the highway bridge would connect the transportation infrastructure with the residents of the coastal slums. The platform pieces would be independently operated to allow delivery of sorted waste to the surface and create multiple scenarios as the platform was re-configured. The expansive space is needed to house a dumping and sorting facility, however, the structure of the bridge would support the platform deck.
As dumping and sorting occurs at certain hours of the day the area could be organized to promote alternate programmatic activities.

P.L.A.T.F.O.R.M.
Brian Lee 2012
III.D.1. Platform: Axonometric

III.D.2 Platform Plan

The dumping platform would be serviced by waste trucks in transit. These vehicles would descend off-ramps and deposit their loads in the designated areas along the deck. The trucks would then continue on their routes while sorters sifted through the waste. Reusable items would be collected and sold in the markets on the platform. Non-toxic solid waste would be deposited into the gabion shapes, as discussed previously. The gabions would then be lowered to the surface and placed strategically within the network. Contaminatants would be contained and depositied witin the enclosed gabion.



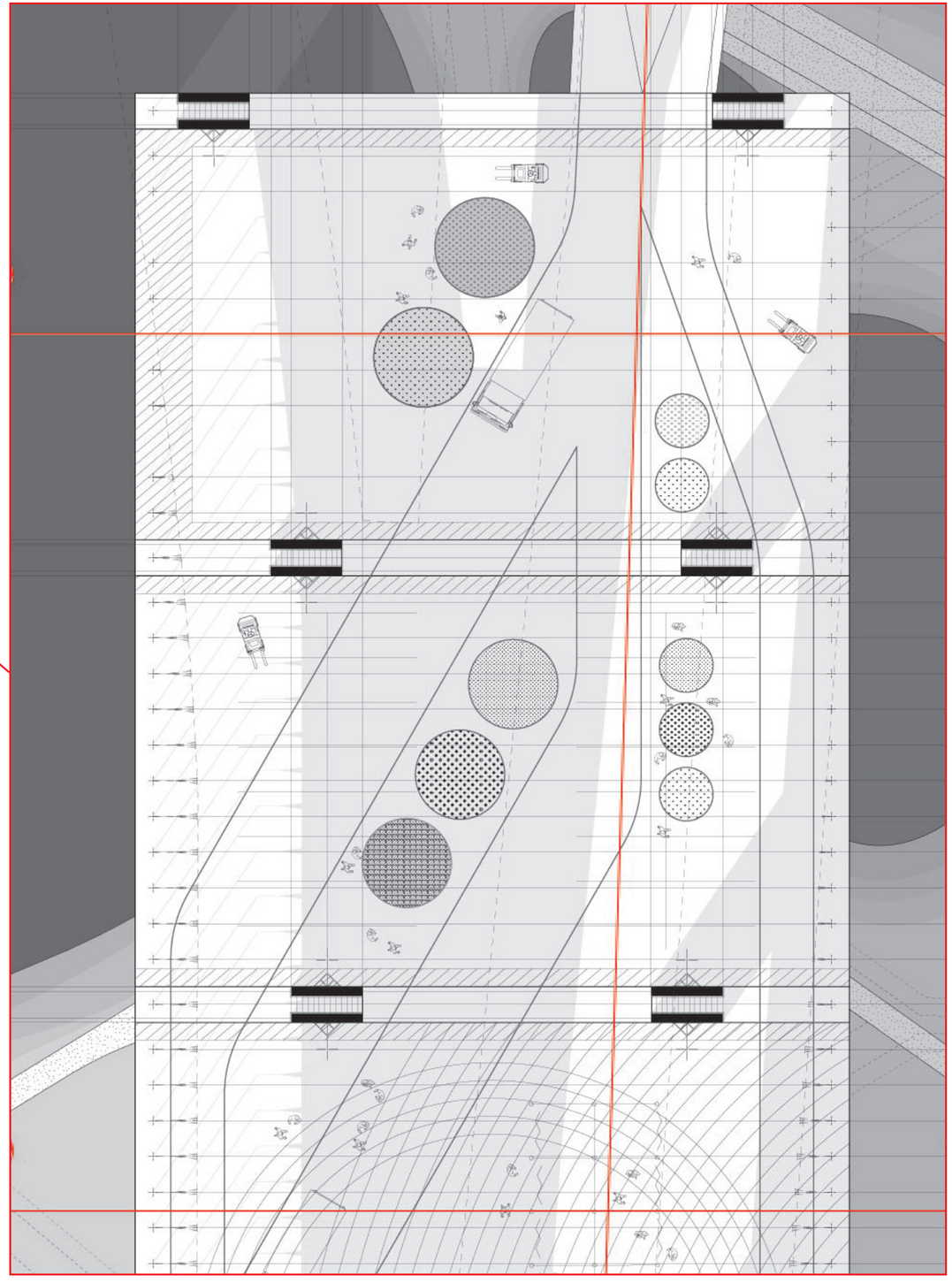


Fig.37 Plan: North dumping and Sorting.

P.L.A.T.F.O.R.M.

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III.D.2. Platform: Plan

Markets centrally located on the platform are removed from the violence and contamination of dumping. Here recycled goods are sold to passing visitors of the platform or to residents of the slums.
The platform would begin to act as a connector between the Third Mainland Bridge, the top-down formal infrastructure, and the bottom-up improvisation of the slums.

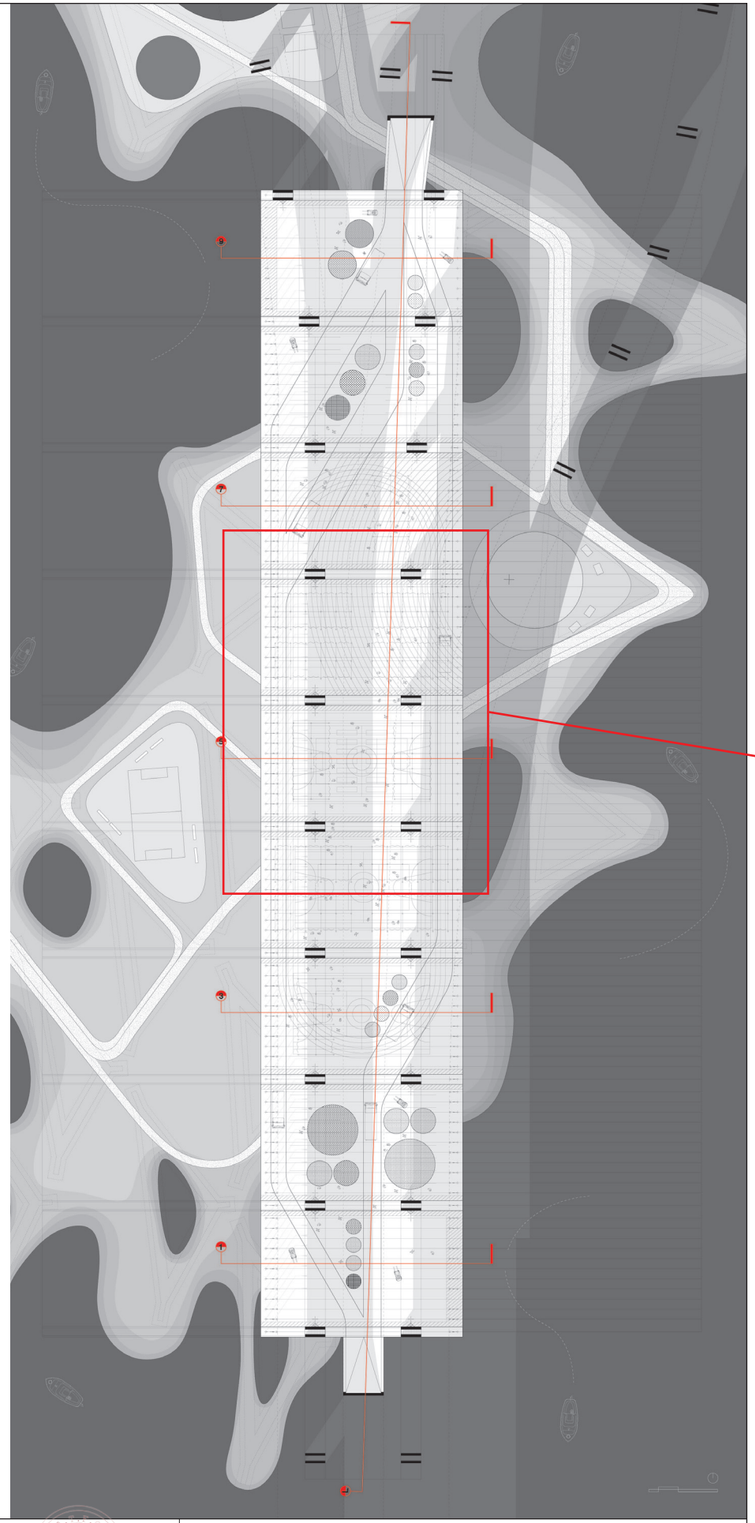
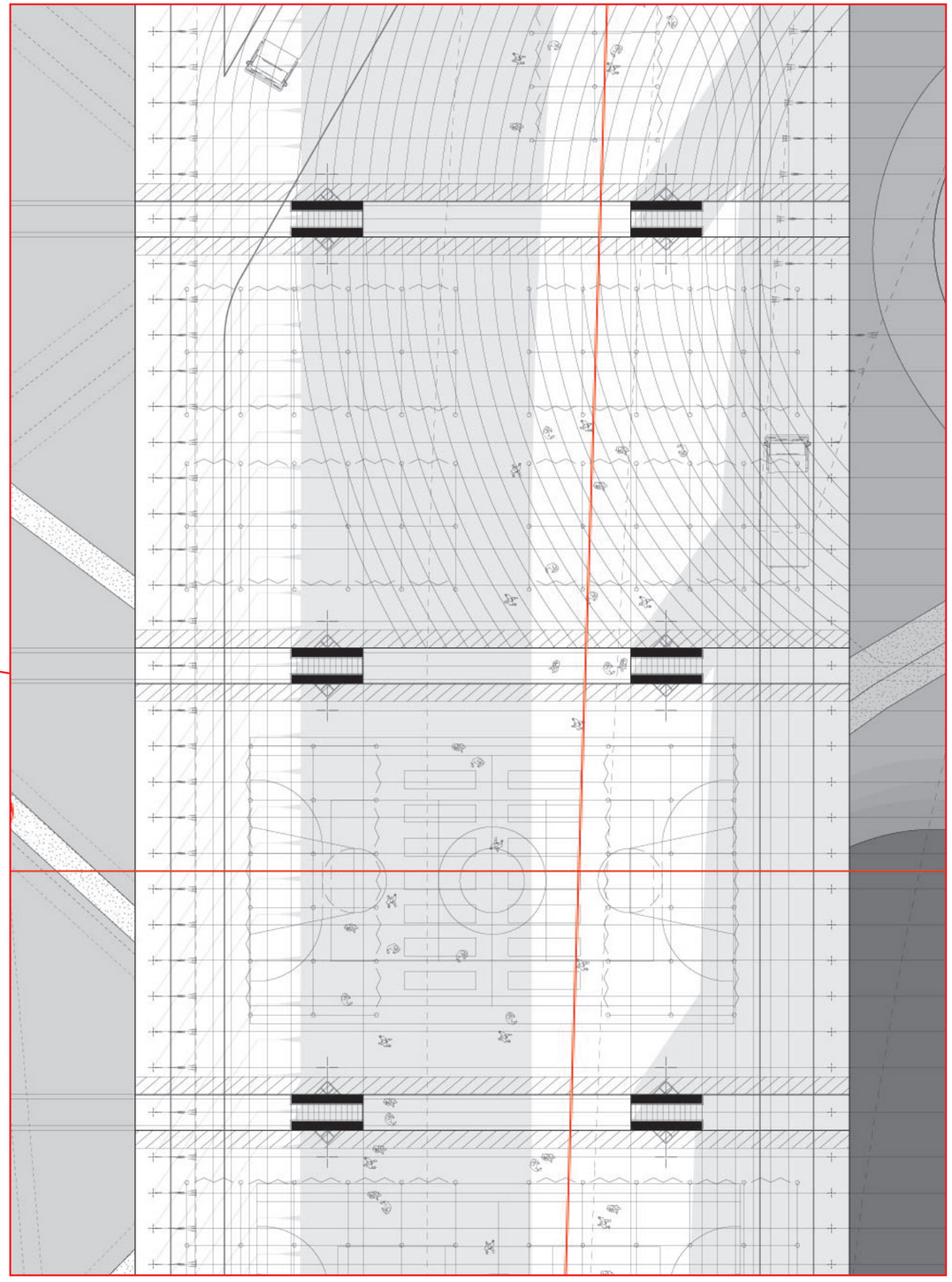


Fig.38 Plan: Central Marketplace and mixed program.



Dumping sites are situated on the ends of the platform to facilitate dumping, sorting, and to separate other programs from the smell and contamination. Additionally, these ends would act as delivery platforms to the ground and boats below. As the gabion network matures, the end dumping platforms serve the inner and outer walls of the barrier.

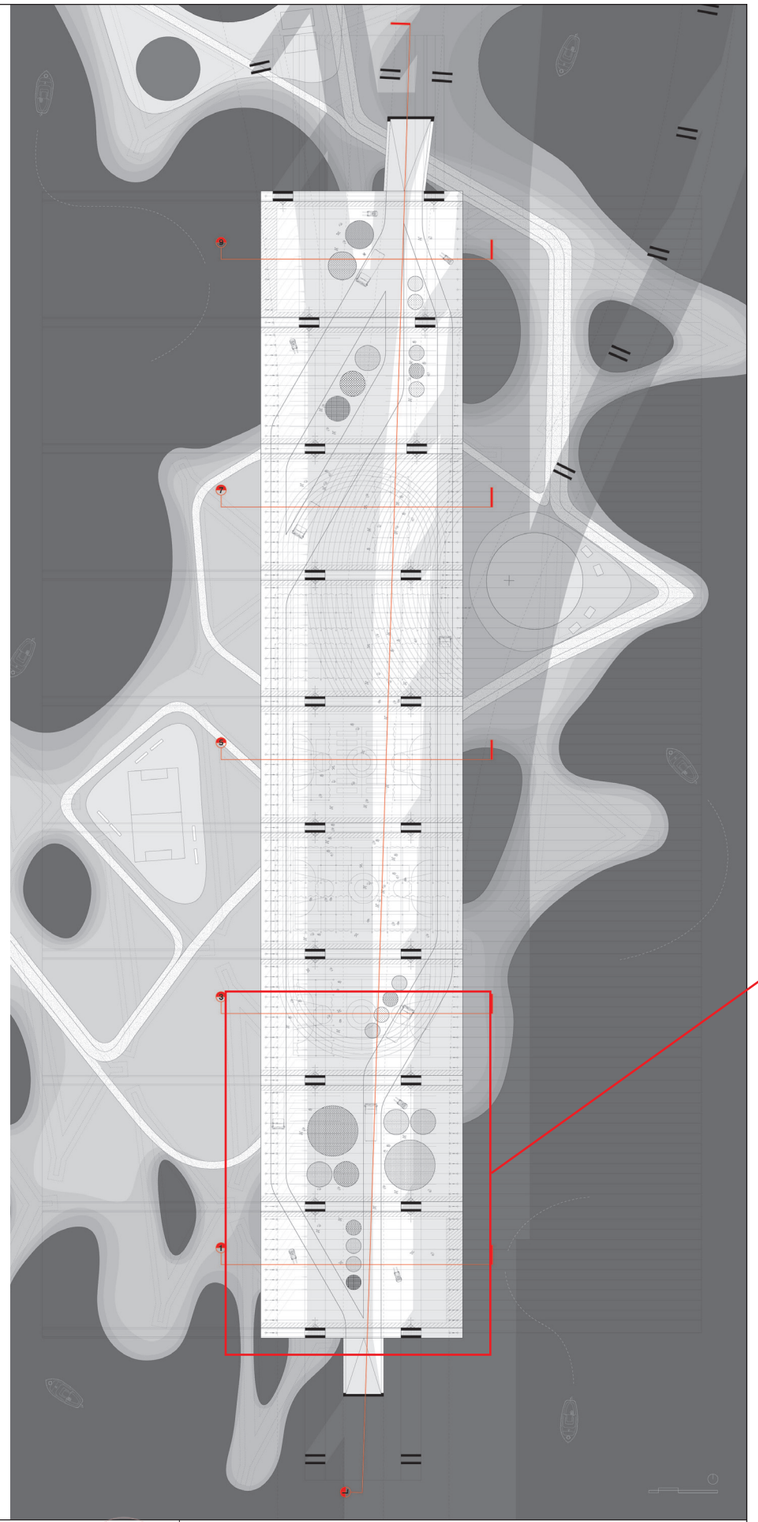
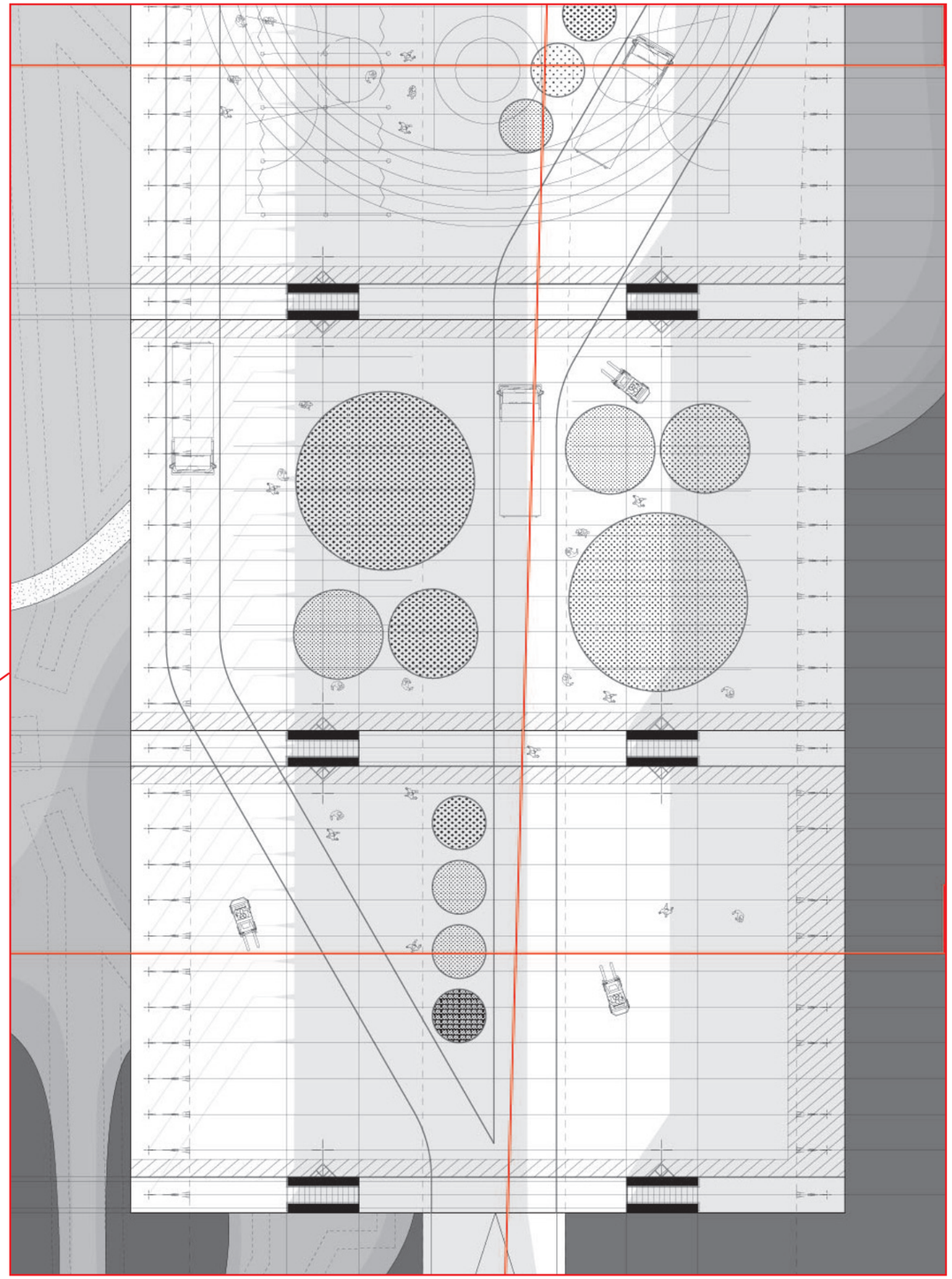


Fig.39 Plan: South Dumping and sorting.



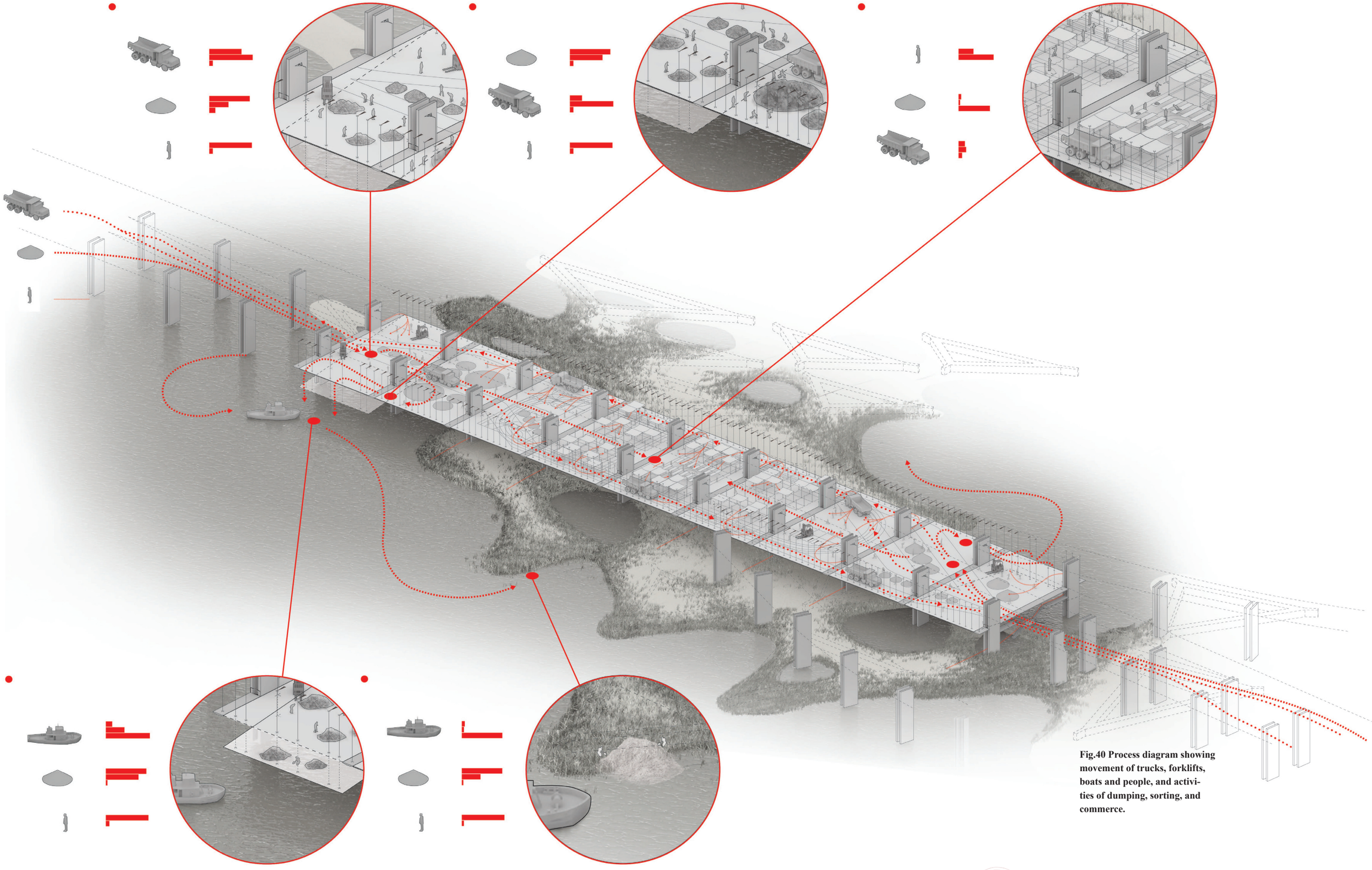


Fig.40 Process diagram showing movement of trucks, forklifts, boats and people, and activities of dumping, sorting, and commerce.

Dumping

trucks
forklifts
boats

non-toxic
toxic
reusable

workers
public

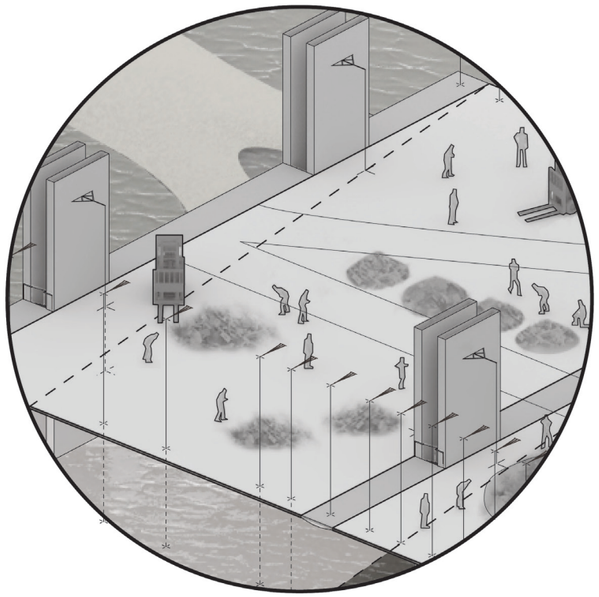


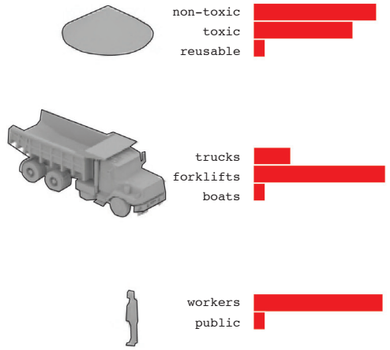
Fig.41 Initial Dumping occurs near the North and South ends of the platform where trucks enter and exit the platform.

III.E. Process

Trucks descend from the highway above, dump waste along the platform and exit through the opposite off-ramp. Sorters then sift through the waste looking for reusable items and separating contaminated waste. This waste is then delivered to boats in the lagoon which distribute the waste to the surface below.

The platform can be configured to the activities on it surface. Each platform segment is independently operable, accommodating the needs of dumping, sorting, and markets.

Sorting



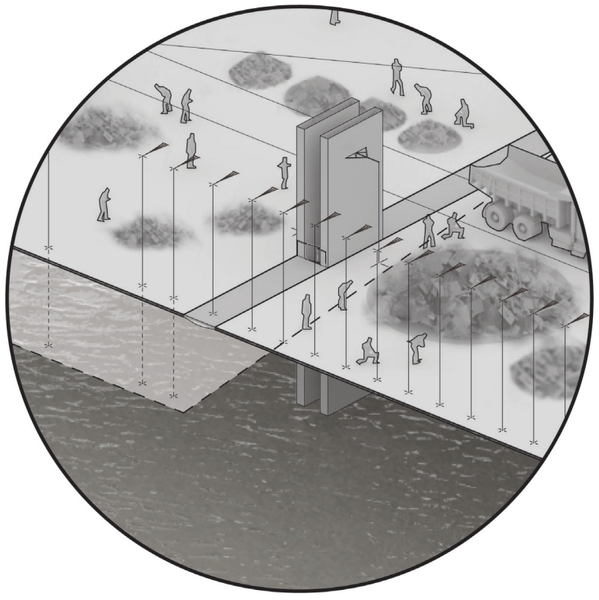
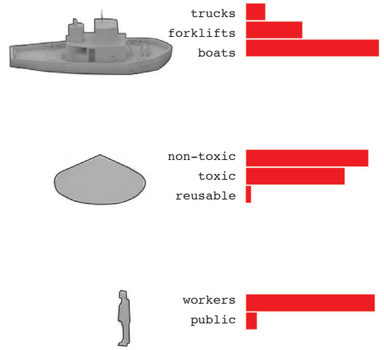


Fig.42 Two sorting stages take place on the platform. First, reusable items are removed and taken to the center of the site to be sold. Second, contaminated waste is separated to ensure proper disposal.

Delivery



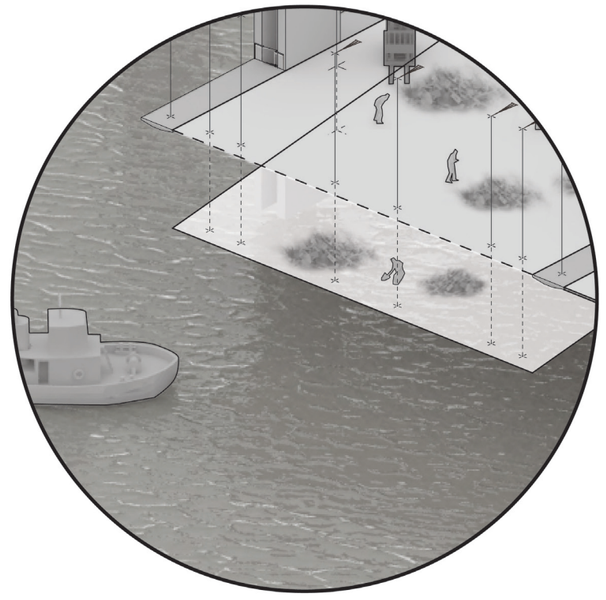
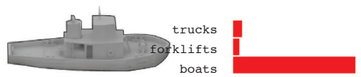


Fig.43 The solid waste is placed within the gabion geometry and the two types of waste are then lowered by the platform onto boats.

Distribution



trucks
forklifts
boats

non-toxic
toxic
reusable

workers
public

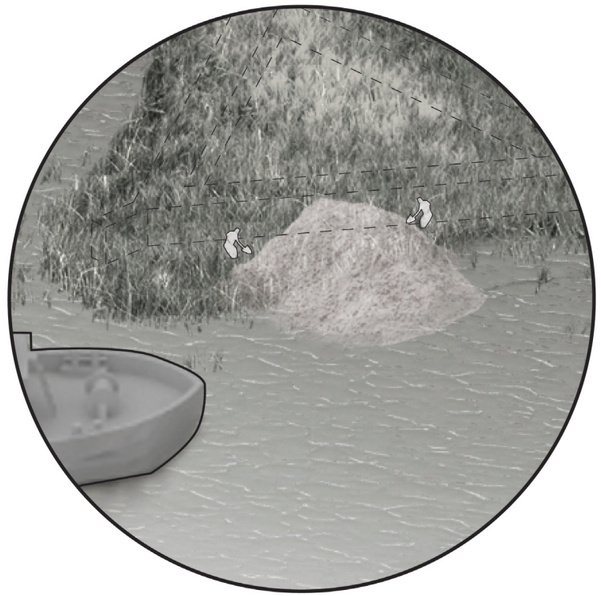


Fig.44 The gabion and contaminated waste is then added to the existing structure of the lower landscape. As the mass of the waste is built up sand is dumped to help fortify the network.

Commerce

workers
public

non-toxic
toxic
reusable

trucks
forklifts
boats

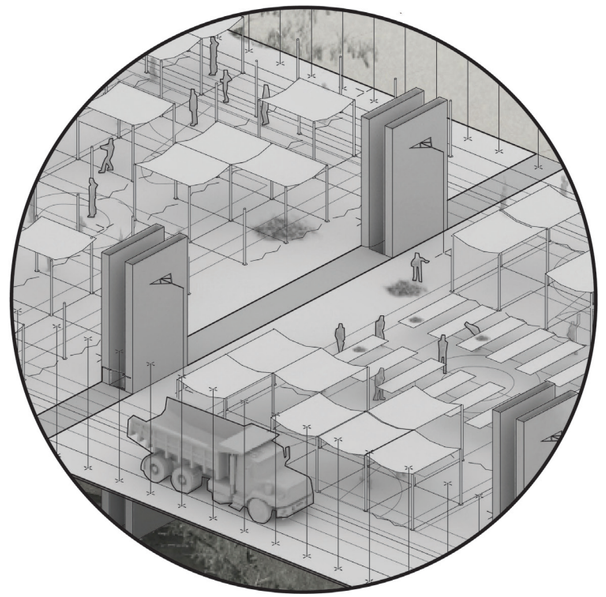
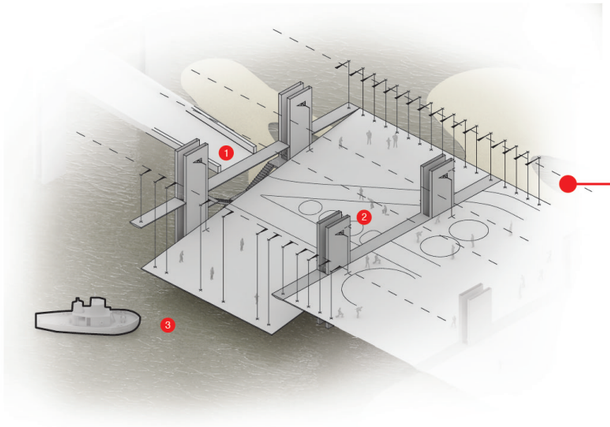
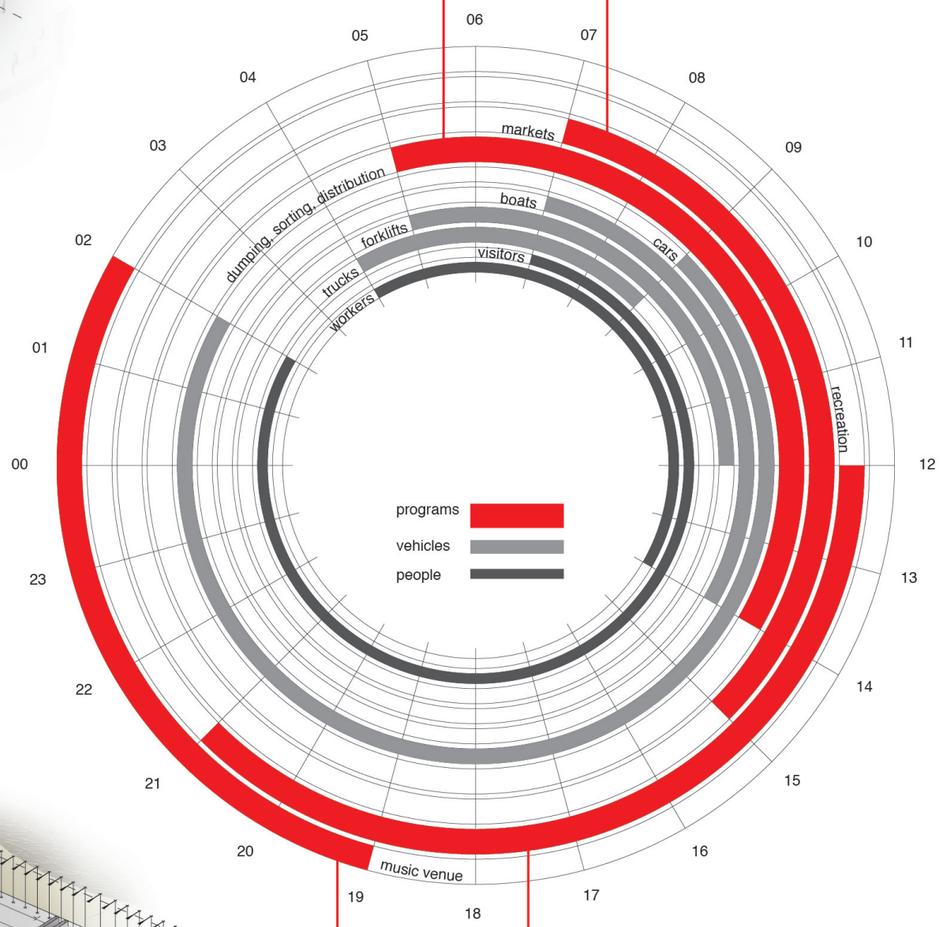
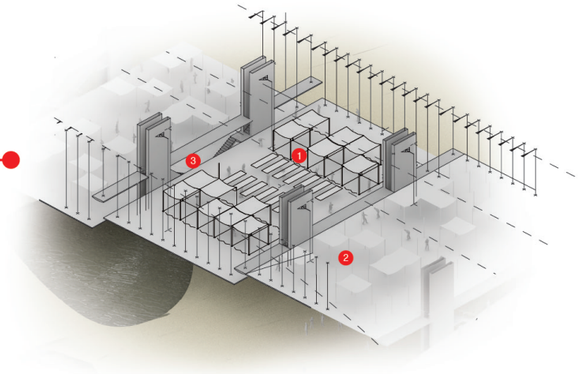
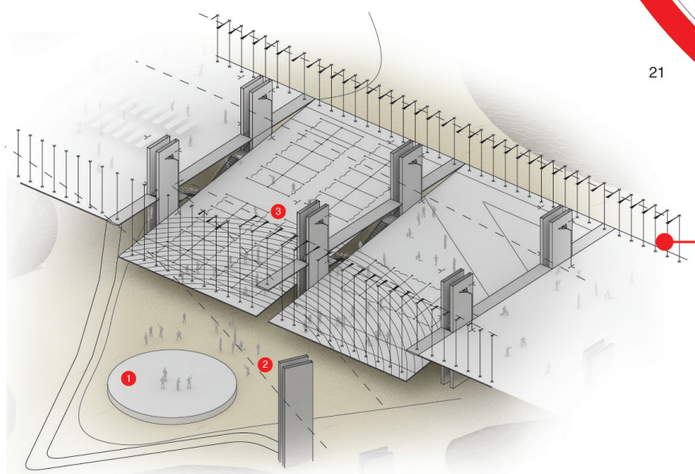


Fig.45 In the center of the platform items sorted from the waste are sold in a marketplace.









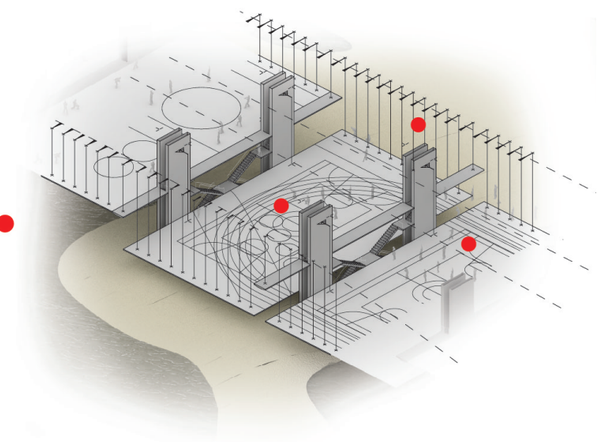
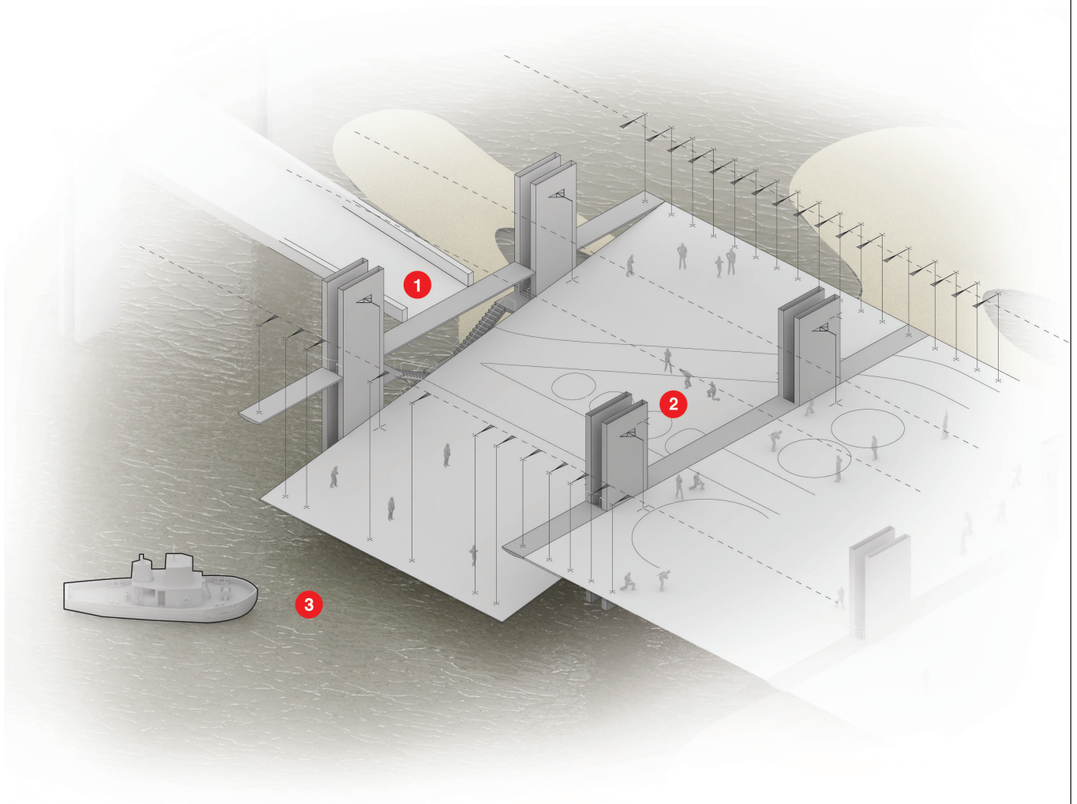


Fig.46 The P.L.A.T.F.O.R.M. Scenarios Time Line showing the shifting uses of the platform and how independent segments and paintlines on the surface create alternate scenarios.



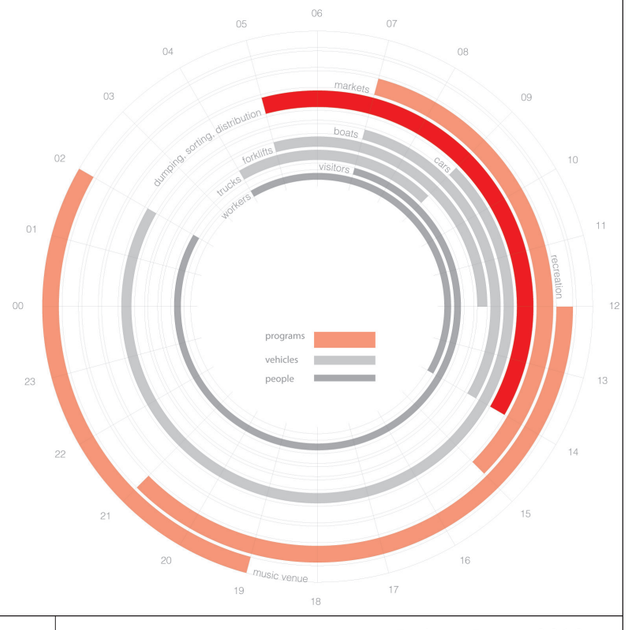


Fig.47 The end platform segments tilt to facilitate the delivery of sorted waste to the ground surface.
1. Off-ramp
2. Tilted Dumping Platform
3. Waste Port

III.E. Process

The platform can be configured to the activities on it surface. Each platform segment is independently operable, accommodating the needs of dumping, sorting, and markets.
Early in the day waste dumping and sorting take place across many of the platform segments. As need for dumping and sorting space decreases other programs can occupy that space. Markets could expand in the later morning and early afternoon. Public recreation space and auditorium space could also occupy the platforms as needed.

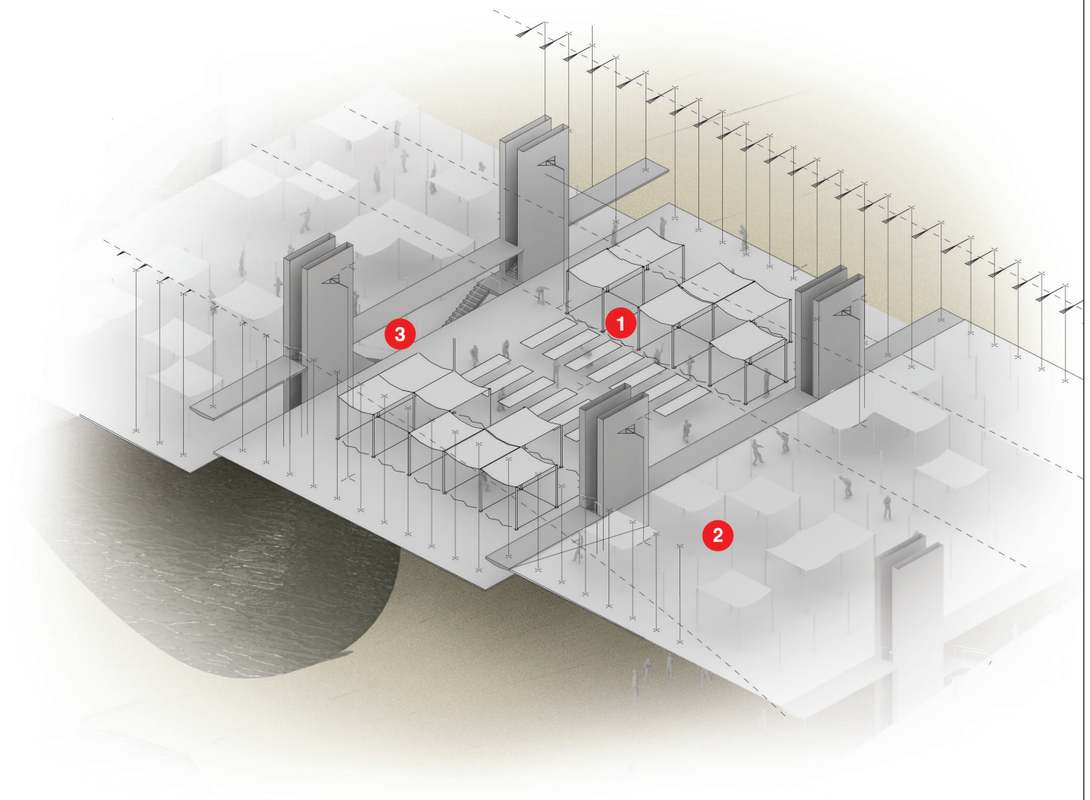
To facilitate the shift in programmatic need the independently operated platform segments could adjust to suit the activity. While dumping takes place all segments are flush, allowing passage to moving dump trucks. As the sorting and distribution take place the end platform would tilt to deliver sort waste to the lower surface. For a market scenario the platform would become segmented creating multiple levels to better engage the ground surface. For recreation a similar configuration.

Fig.48 Next Page: Dumping Scenario Rendering

P.L.A.T.F.O.R.M.

Brian Lee 2012

III.F. Scenarios: Dumping



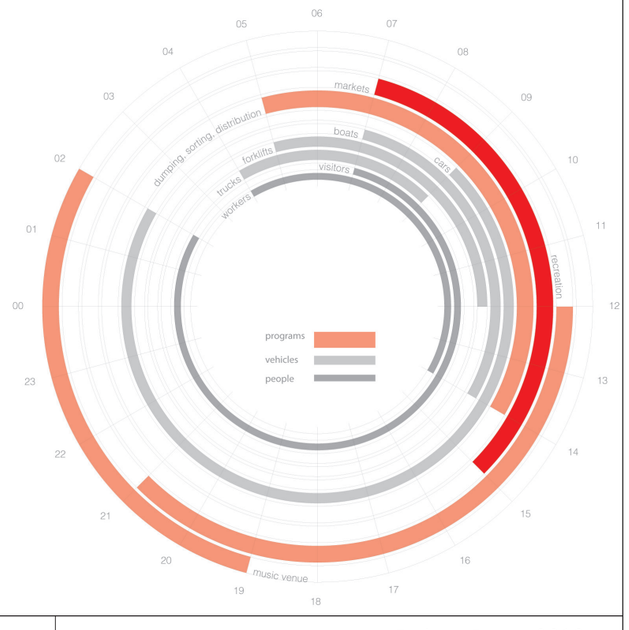
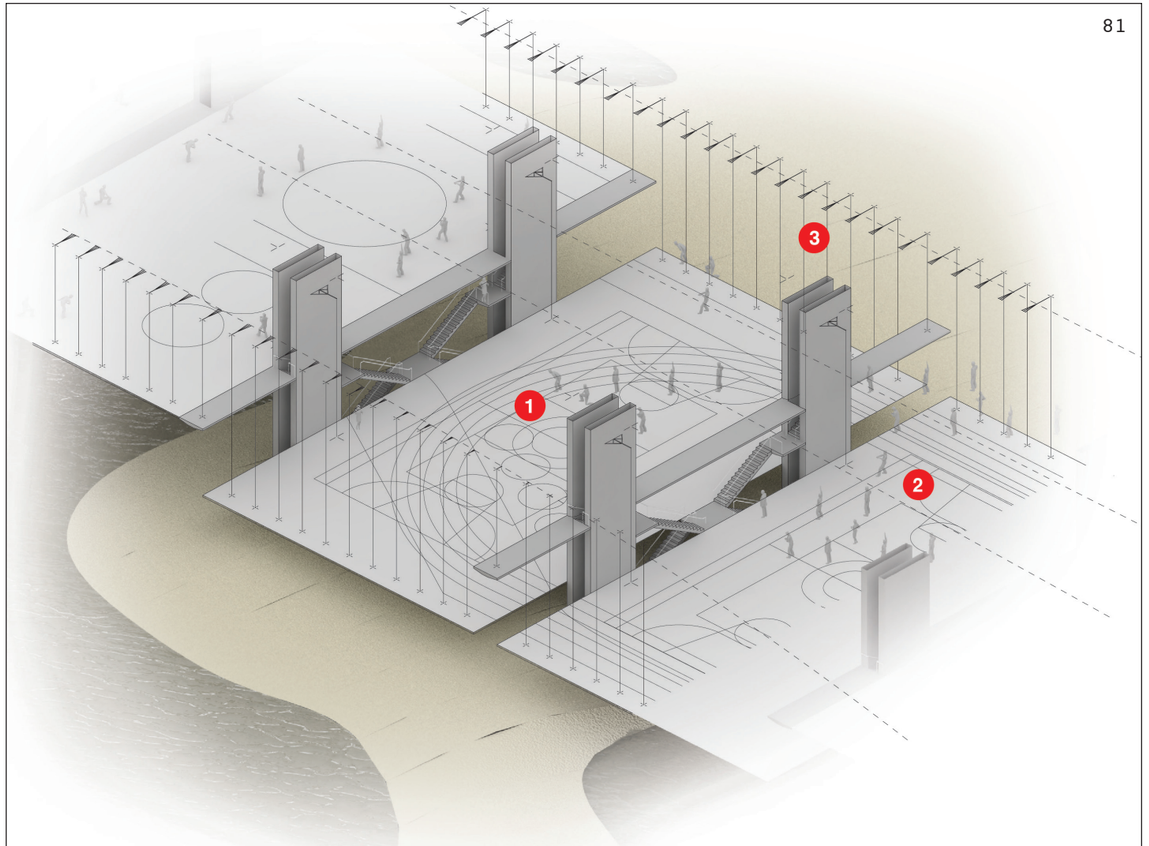


Fig.49 A segmented market scenario allows for a less expansive space that better engages with the ground surface and creates alternate relationships between platform segments.
1. Market
2. Alternate Level Market
3. Circulation



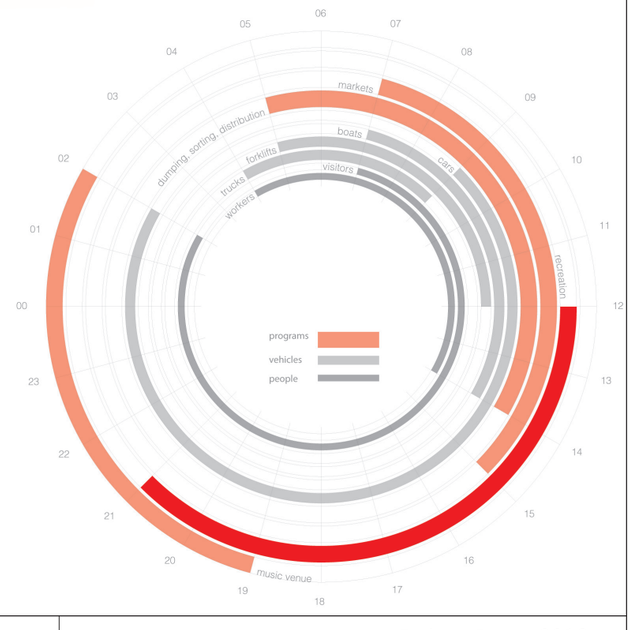
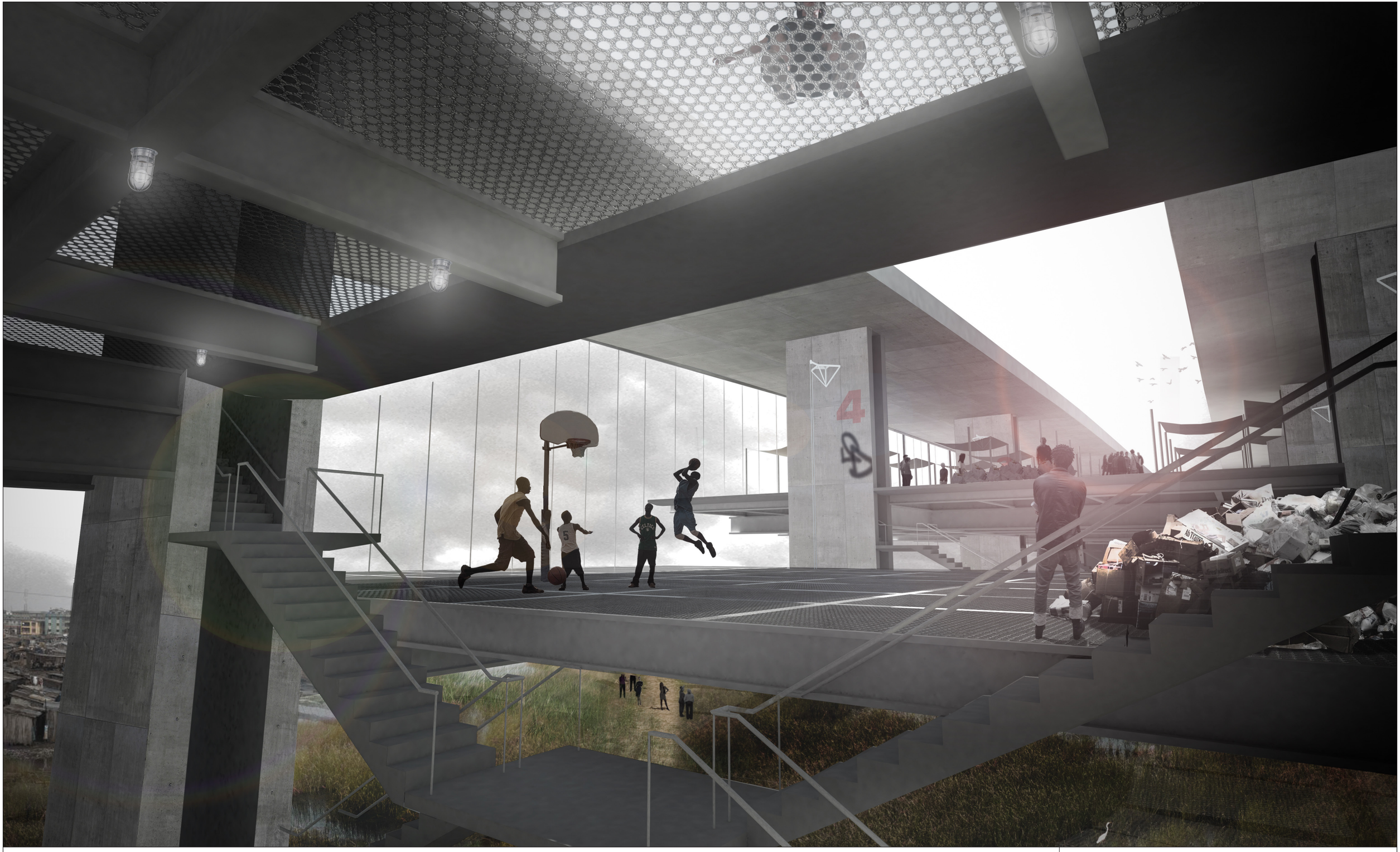


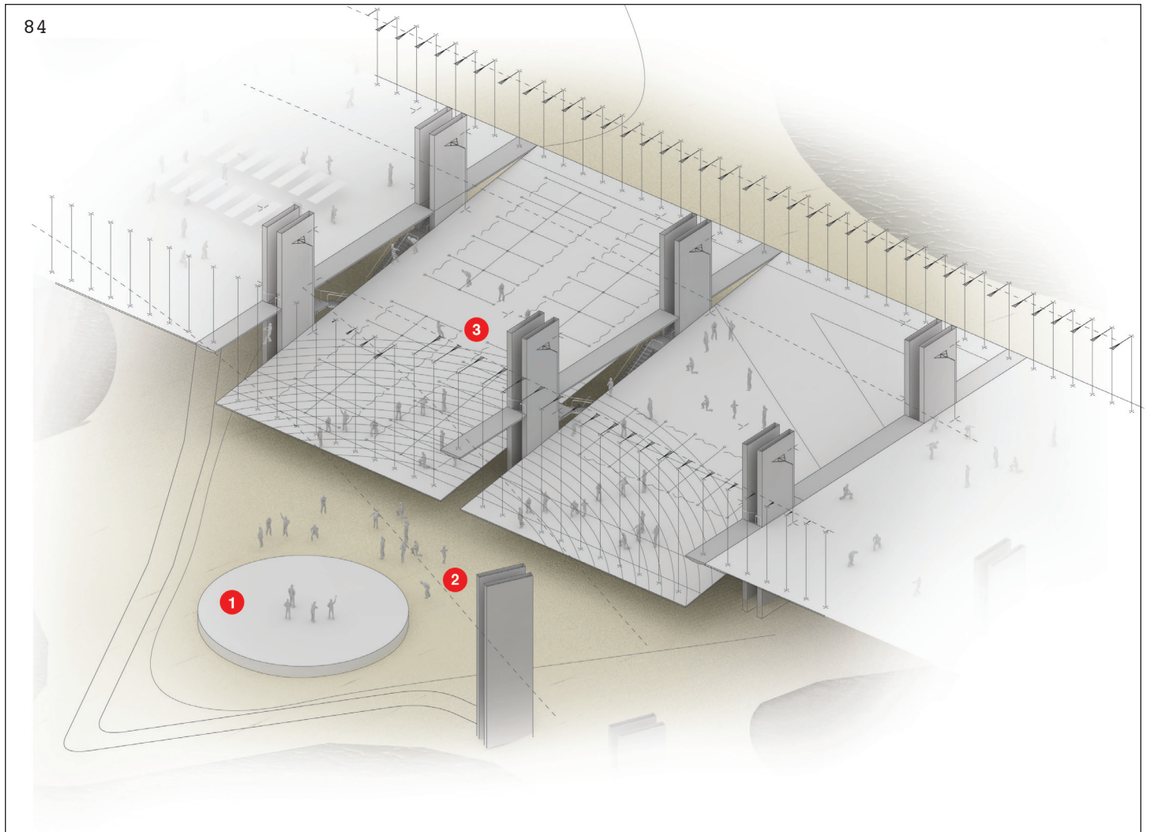
Fig.50 A recreation sceanario connects with the ground and allows the adjacent elevated platform segments perspective to the lower segment's activity.
1. Recreation Space
2. Relationship to Ground
3. Tiered Observation Platforms



P.L.A.T.F.O.R.M.

Brian Lee 2012

III.F. Scenarios: Recreation



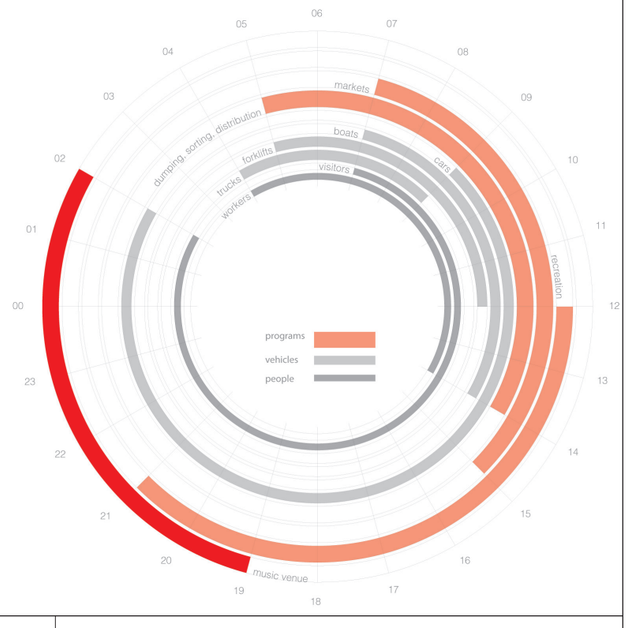


Fig.51 Previous Page: Recreation Scenario Rendering

Fig.52 In the theater scenario tilted platform segments act as auditorium seating oriented toward a stage at ground level.
1. Stage
2. Open Public Space
3. Auditorium Seating

Not only would the configuration of the segment define the current scenario but also the surface treatments. Paint on the surface of the platform would delineate spaces and define borders. These active paint lines would act as markers for the platform users defining program in two dimensions.

Fig.53 Next Page: Theater Scenario Rendering

P.L.A.T.F.O.R.M.

Brian Lee 2012

III.F. Scenarios: Theater

IV. Conclusion/Summary

Lagos, Nigeria is a city of rapidly shifting conditions and perpetual crises with issues of over population, pollution, limited circulation, waste management, density, poverty, and social disparity.

For Lagos, an estimated population growth of nearly six percent equates to about a half a million new residents per year. The largest and fastest growing city in Sub-Saharan Africa, Lagos barely manages to support the influx of migrants and rural transplants seeking work in the region's financial and commercial center, let alone the extreme internal birth rate of its own people.

The growth of Lagos has led to a conflict between two types of development. As the formal publicly planned urbanization strategies have failed to keep pace with current growth rates, new inhabitants advance the expansion of informal slums. These slums rely on access from the water, bypassing existing modes of urban circulation and development. Large, dense communities have arisen along coastal regions, some settlements actually built on the water. The slums act as infill to the cities minimal vacant space and ignore the geographic boundaries of the city by expanding into the coastal waters of Lagos Lagoon. Not only do these slum areas face extreme challenges of poverty and sanitation, but predicted sea-level rise over the next one hundred years indicates that much of the territory of the coastal slums will be over taken by water.

The crises of waste management has become an opportunity and given rise to innovation within Lagos. Waste sorters wait alongside dump trucks searching for valuable materials that can be resold. Along coastal edges trash is dumped into the water and covered with sawdust and sand. The process is expanding the coastline but contaminating the surrounding water.
The social and ecological extremes of Lagos are seen as opportunities for their inherent processes; a way to survive for the individual. The adaptability and resourcefulness of the residents provides an interesting environment for an intervention that can better exploit innate aspects of the existing systems.
The radical conditions of Lagos promote new solutions for the city. Waste provides the mass for coastal expansion, and defense from sea-rise. Expansion of the coastline provides new territories for the growth of slums. Geometry can maximize efficiency and minimize contamination. P.L.A.T.F.O.R.M., makes use of the processes associated with Lagos waste management and the expansion of the slums, while mitigating the harmful effects of contamination and providing a defensive barrier against sea-level rise.

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